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LAND USE CLASSIFICATION IN THE SPECIAL AREAS OF ALBERTA

AND IN ROSENHEIM AND ACADIA VALLEY

A. STEWART and W. D. PORTER

Marketing Service Economics Division
Dominion Department of Agriculture

in co-operation with

The Department of Political Economy
University of Alberta

Published by authority of the Hon. JAMES G. GARDINER, Minister of Agriculture
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FOREWORD

This bulletin is one of a series on land classification in Alberta and Saskatchewan. These projects have been undertaken as a part of the program of research inaugurated under the Prairie Farm Rehabilitation Act. Responsibility for the direction of economic research has been assumed by the Economics Division, Marketing Service, Dominion Department of Agriculture, Ottawa, but in Alberta the project has been carried on in co-operation with the Department of Political Economy, University of Alberta.

The methods employed in establishing the classification of land described in detail in this bulletin are similar to those used in Saskatchewan. There has been constant exchange of ideas and personnel and the result has been close co-ordination in carrying out the program of research upon which the classification is based. There is of necessity some variation in presentation because the problems vary to some extent.

In this publication considerable stress has been placed on the fundamental ideas upon which an economic classification of land may be based. An understanding of these principles is necessary for the proper interpretation and use of both the classification itself and the supporting data contained in this report.

The authors desire to acknowledge the assistance of G. H. Craig, formerly of the Economics Division, Dominion Department of Agriculture, who directed the earlier studies; J. Proskie who supervised the field and office work in 1937 and 1938; B. K. Acton who checked the classification in 1939 and Dr. C. C. Spence, Assistant Economist, Economics Division, Dominion Department of Agriculture, Saskatoon, for much technical guidance.

The Department of Soils, University of Alberta and their collaborators in the Experimental Farms Service, Dominion Department of Agriculture, have provided much useful data regarding the soils of the areas included in this study.

To the Royal Canadian Air Force and the Air Photographic Library, Bureau of Mines and Geology, Department of Mines and Resources, Ottawa, who provided valuable assistance in making aerial photographs available, the authors are especially grateful.

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LAND USE CLASSIFICATION IN THE SPECIAL AREAS

A. STEWART[1] AND W. D. PORTER[2]

PART I

LAND CLASSIFICATION IN RELATION TO THE PROBLEM OF THE DRY AREAS

THE PROBLEM OF THE DRY AREAS.—The outstanding feature of the history of settlement in the dry areas of Western Canada is the recurrence of periods of expansion and contraction. This characteristic instability may be considered to constitute the problem of the dry areas.

CAUSES OF INSTABILITY.—Changes in agricultural activity in any area may result from a number of different causes. In the dry areas the immediate causes of recurrent expansion and contraction have been fluctuations in weather, principally rainfall, and prices[3]. Expansion has occurred when these conditions were favourable; periods of contraction have accompanied, or followed, years of relatively unfavourable weather or price conditions. But this is not a complete explanation. If the present knowledge of rainfall and of the factors affecting prices during the period 1905 to 1939 had been available in 1905, the history of the dry areas might have been substantially different. In other words, the fundamental cause of a large part of the instability has been lack of knowledge and inability to predict the future.

CONSEQUENCES OF VARIABILITY AND UNCERTAINTY.—Under variable conditions of output and prices production appears as a highly speculative undertaking. The chance of making large returns from a succession of highly profitable crops, or even one 'bumper' crop, is enough to attract people; the same chance induces people to persist even after substantial losses have been experienced. Further, recurrent periods of relatively favourable and unfavourable conditions generate waves of optimism and pessimism. In periods of favourable conditions, current expectations of the future are coloured by the prevailing circumstances, general optimism develops, and this is itself a factor promoting expansion. In this way land 'booms' emerge. The tendency, during unfavourable periods, to discount the future too heavily is perhaps less significant. There are greater impediments to contraction than to expansion; there is also the persistent chance of the appearance of a large crop which may be sufficient to compensate for losses already sustained.

ACCUMULATION OF KNOWLEDGE.—At the time of the first agricultural settlement of the dry areas, the physical possibilities of the land for grain production, and the future grain prices were both largely matters of conjecture. Over the whole period of settlement, important advances have been made in accumulating knowledge of conditions affecting grain production in the dry areas. This knowledge has been accumulated through research, investigation, the keeping of statistical records, and by experience gained through the process of trial and error on individual farms.

At the present stage, soil surveys have covered all the driest areas in the province of Alberta, and a broad description of the type of soil in particular

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(3) Data showing the fluctuations in precipitation, yield, prices and population can be found in Appendix C.

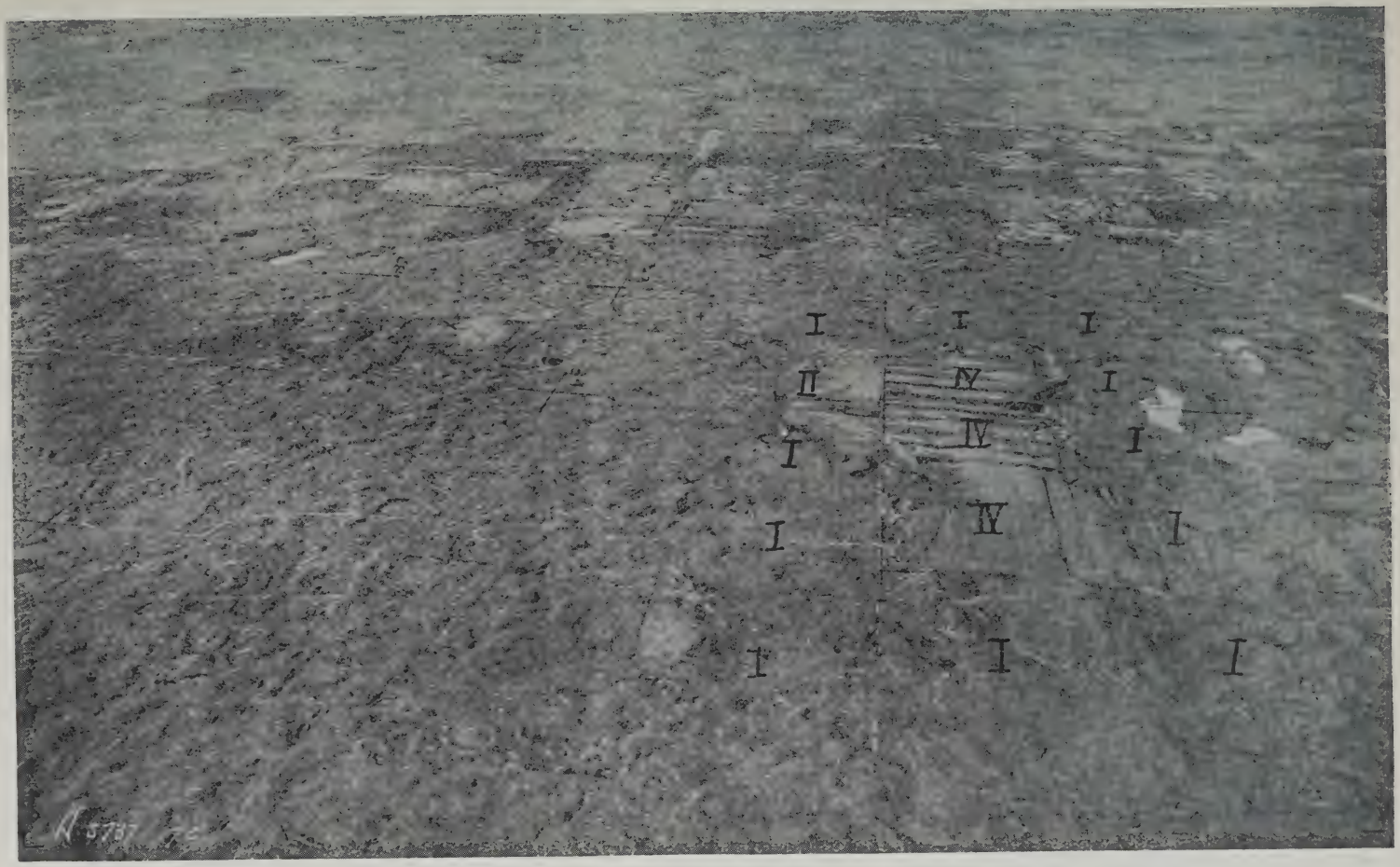
parcels is now available. Records of weather conditions have been kept at some points throughout the dry territory. These records provide both a reasonable presumption as to the climatic levels which may be experienced over extended periods in the future, and an indication of the extent of the annual variations which may be expected. Experience in production, and the recording of yields, have contributed to establishing the productivity of the lands of the dry areas, under given methods of production and weather conditions. Research and experimental work, including that of the individual farmer, have disclosed increasingly effective methods of dealing with the problems of dryland farming.

Limitations of Present Knowledge.—Despite the advance in knowledge, uncertainty has not been entirely eliminated. In the first place, important deficiencies in attainable knowledge remain. Soil surveys have not yet been carried out in the detailed manner necessary for a complete description of the soil in particular parcels. Little is known of the effect of different degrees of variation of soil type, topographical irregularities, stoniness, and other physical features, on the productivity of land. Meteorological records are available only for scattered points; and may not provide an accurate indication of local differences in climatic factors. Perhaps most important of all, accurate records of crop yields are difficult to secure. Improvement in these various matters is possible. In the meantime knowledge is still seriously restricted.

Secondly, in relation to the problem at hand, past experience cannot be accepted as an infallible guide to the future. Experience has shown that periods of relatively favourable weather conditions are followed by, and in turn follow periods of relatively unfavourable conditions. These periods, covering several years, are not always equal in duration. Moreover, dry years occur within periods of above-average precipitation, and wet years occur during dry periods. This irregularity in weather variations from year to year makes it impossible, at the present time, to predict the sequence in which individual 'good' and 'bad' years will occur. It is not possible, on the basis of past experience, to predict what the weather conditions in each of the next twenty years will be. Further, it remains uncertain how closely the level of climate over the past will be paralleled over any relevant period in the future. The possibility of a trend in climate cannot be entirely ruled out. More important still, the effectiveness of a given amount of precipitation may be different in the future. It is also true that the forces affecting future costs and prices cannot be confidently predicted. The most reasonable assumption may be that these forces will remain substantially unchanged. On the other hand, technical advances, appreciably affecting productivity and costs, may occur; the demand for the products of the dry areas may change. These conditions cannot be forecast with complete assurance.

The limitations of existing knowledge imply that judgment is unavoidable in decisions regarding the use of land in the dry areas, no matter by whom the decisions are made. But reasonable judgments require the application of all the available information. The significant expansion of knowledge encourages the belief that decisions so based will result in an appreciably greater measure of stability than has been experienced in the past.

Application of Available Information.—Up to the present the relevant information has been available only from scattered sources, often inaccessible to individuals. Under such conditions, persons interested in particular parcels of land experience considerable difficulty in acquiring all the known information about the land, and are therefore likely to be less well-informed than the existing state of knowledge would make possible. The collection of all the relevant information, by a single agency, would aid materially in making present knowledge effective. More reasonable judgments on the part of individuals would be expected, if it were possible, through the services of such an agency, to secure a description of any parcel of land in terms of the known factors affecting its



Royal Canadian Air Force Photograph

PLATE 1. A Pocket of Clay Loam in the Neutral Hills. Twps. 34 and 35; Rge. 3. Oblique Photograph.

profitable use, that is, soil, topography, condition of land, precipitation, incidence of diseases and pests, past yields and other factors. But it may be useful to go further than this.

Land Classification.—A mere description of the various elements affecting productivity is not a sufficient basis on which to judge the potentialities of land for any form of production. Rational decisions respecting the use of land, regardless of the persons by whom the decisions are made, require consideration of the relations between these various factors, and of their joint effects in determining the profitability of productive enterprise. The interpretation of the relation between the known factors in terms of the returns which may be expected is the process of classification of land for use.

This report deals with the classification of land in a portion of the province of Alberta in which the problems of uncertainty and instability have been most acute. The classification is the result of analysis based on careful consideration of available information, supported by observation and investigation in the field. It is intended primarily as a guide to the use of land, to the end of securing a greater measure of stability than has been experienced in the past. It may prove useful in directing attention to considered judgment regarding the long-run potentialities of individual parcels, and in reducing the effects of ill-considered speculation and unwarranted optimism.

PART II

THE GENERAL APPROACH TO LAND USE CLASSIFICATION

A classification designed as a guide to the use of land represents a decision, if not a recommendation, regarding land use. Any classification for this purpose involves certain assumptions, the validity of which affects its significance. The correct interpretation and wise application of the classification depend on an appreciation of these assumptions. Consequently, if it is to commend itself to others, and if it is to be used intelligently, the method of classification should be outlined, and the reasoning underlying the procedure clearly stated. The purpose of this part of the report is to outline the reasoning underlying the technique of classification employed in this study. The detailed statement of method is given in Part III.

Conditions Necessary for Stability.—The object of the classification has been stated as that of aiding in securing a greater measure of agricultural stability than has been experienced in the surveyed area in the past; it is designed as a guide to the use of land.

Agricultural production requires the use of land, labour and capital. When contraction of production occurs, farm land is abandoned, or remains idle; equipment is discarded, or is taken elsewhere; farmers and farm workers are unemployed, under-employed, or move to some other situation or occupation. On the other hand, expansion of production results from the increased use of land, labour and capital in the area. Farmers move in and bring with them the equipment required; idle land is taken up; capital is invested in the clearing and breaking of land; labour is drawn into the area for employment on new farms, or for increased employment on existing farms. The problem of land use is the problem of production. Stable land use implies stable production, which in turn means stable use of all the various resources, human and material, employed in agricultural processes.

Why do the movements of resources associated with expansion and contraction take place? Under conditions of individual enterprise the co-ordination of land, labour and capital in the productive unit is the function of the farmer. So long as, and to the extent that, the individual farmer performs this co-ordinating function, the progress of production is determined by the farmer's decisions. Farmers move into an area, equip farms, break land, and employ labour because they expect to be able to pay the contracted prices for the instruments they hire, meet their operating expenses, and receive returns on their investment and effort which will compare favourably with the returns they would expect to get elsewhere. Contraction, no less than expansion, of production is affected by the expectation of returns. If the returns expected are less than those which it is presumed can be obtained elsewhere, withdrawal will tend to occur. It is true that this process is difficult, and at times the opportunities elsewhere are limited. But contraction of production implies that farmers believe they can employ their resources to greater advantage elsewhere or in some other way; and so long as this expectation prevails there will be a pressure toward contraction.

Agricultural settlement and production in any area would be stable, if the expectations of the farmers, at the time of settlement, were subsequently realized. Each farmer could then meet his commitments in connection with production, and secure returns from his farming operations comparable to the returns to be secured elsewhere. Under actual conditions complete stability cannot be expected. New production techniques, competition from other producing areas,

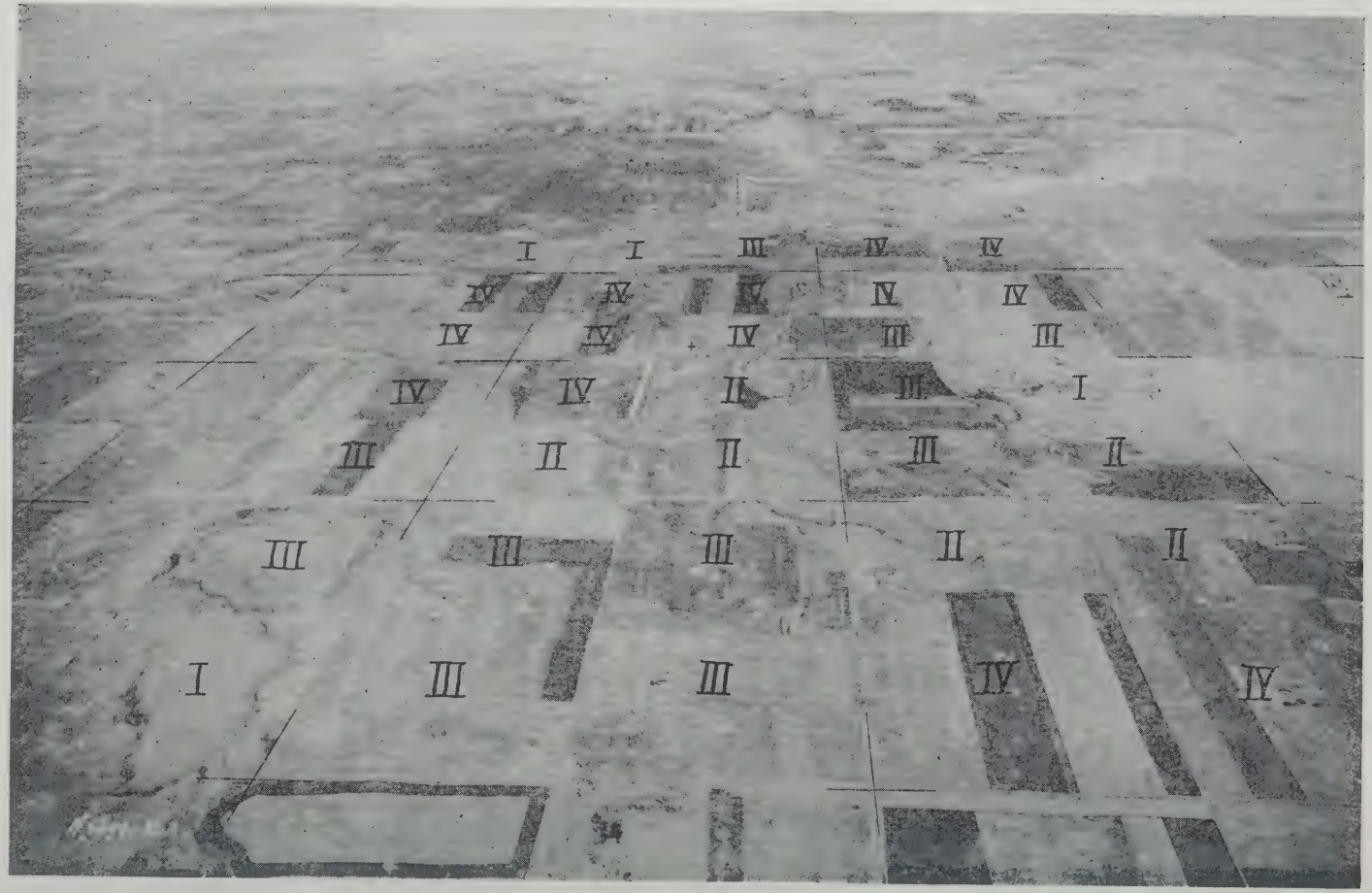


PLATE 2. Class III and IV Parcels in Sullivan Lake. Twps. 29 and 30; Rge. 16. Oblique Photograph. *Royal Canadian Air Force Photograph*

changes in demand for particular products, and other dynamic factors, lead to a continuous process of adjustment. Under the impact of these forces some areas may 'grow', while others decline. But the characteristic instability of the dry areas is the result of other conditions.

Where, as in the dry areas, marked irregularities in weather and prices occur, returns to the farmer may vary greatly from year to year. If farmers have limited knowledge of the nature of weather and price variations, their decisions are likely to be considerably affected by the current level of returns. Consequently, with high returns because of favourable weather and price conditions, expansion tends to take place. Later, when unfavourable conditions recur and earnings are low, it becomes apparent that expansion has been based upon over-optimistic expectations of the level of returns and contraction occurs. A succession of bad years seriously reduces the farmer's capacity to produce. If stability is to be secured, production programs must be determined on the basis of the returns which can reasonably be expected over an extended period, that is, over a period long enough to cover both favourable and unfavourable conditions. This is merely to say that in considering the returns to be expected, the long-range view is necessary if stable settlement is to be secured.

Land classification for use then appears to involve a problem of estimating the returns which may be expected, in the long-run, from use of specified pieces of land. This is the essence of the method employed in this study.

Submarginal, Marginal, and Supra-marginal Land.—When settlement is extending, the problem of the potential settler is that of deciding whether or not it is to his advantage to take up a particular piece of land. To reach an intelligent decision on this he would have to consider, first, the value of the output from the land, the revenue, and, second, the costs incurred in producing this. The revenue would vary with the 'quality' of the land. Apart from any payment for the use of land, whatever form that payment might take, his costs would include payments for the things used in production; and, if he is to be induced to settle, he would include as an essential element in his costs, a 'sufficient' return to his own effort and enterprise. When costs are defined in this way it becomes clear that three 'qualities' of land might be distinguished. First, land which could not be expected, in the long-run, to yield revenue sufficient to meet production costs. Second, land from which expected revenue is just equal to production costs. Third, land which could be expected to yield revenue in excess of costs(1).

The second 'quality' of land is obviously at the centre of the problem, and land in this category has come to be referred to as 'marginal land.' Marginal land, is, therefore, to be understood as land which, without payment for its use, may be expected to provide a return to the farmer merely sufficient to induce continuity of production. The farmer purchasing marginal land could not expect to get any return on his investment. If the purchase were made with borrowed capital the contracted rate of interest could be paid only by reducing the returns to the farmer below the level consistent with sustained production.

(1) A simplified arithmetic illustration may clarify the essential distinctions. Assuming that the costs were the same on different grades of land, the situation on each of three qualities of land might be represented as follows:

Land	Revenue	Costs	Difference between Revenue and Costs
	$	$	$
A	900	1,000	− 100 First 'quality' (Submarginal Land)
B	1,000	1,000	0 Second 'quality' (Marginal Land)
C	1,100	1,000	+100 Third 'quality' (Supra-marginal Land)

Royal Canadian Air Force Photograph

PLATE 3. Bad Lands and Class III Parcels in Berry Creek. Twp. 28; Rge. 18. Oblique Photograph.

Land less productive than marginal land is said to be 'submarginal' (the first 'quality' referred to above). The term submarginal therefore implies that even if the land were secured without payment for its use, the returns which could be secured would be insufficient to induce the farmer to farm the land permanently.

More productive land is above the margin, or is 'supra-marginal' land (the third 'quality' referred to above). This grade of land may be expected to provide a surplus of revenue (net revenue) over essential production costs. Farmers operating on this land would secure the same returns as farmers on marginal land, that is, returns sufficient to ensure continuity of production, if the net revenue were paid off in the form of rent, or capitalized in the purchase price of the land.

ESTIMATING NET REVENUE.—From the accounting point of view, the net revenue is equivalent to the difference between gross revenue, where gross revenue is equal to the value of the total gross production, and production costs which include (a) the value of the produce used in production on the farm; (b) operating expenses, namely, labour, fuel and oil, taxes, etc. (but not rent or interest on investment in land); (c) upkeep of equipment, namely, repairs and depreciation; and (d) sufficient earnings for the farmer, which may consist of cash income and farm produce (perquisites) consumed by the farm family(1).

However, the gross revenue and production costs are jointly determined by the following factors: (a) Choice of the product (or products) produced; (b) Prices of the product, and of the things used in production, over a period of time in the future; (c) Quantity of the commodity produced, which is the product of (i) the output per unit of land, and (ii) the size of the farm unit; (d) Quantities of the things used in production, which depend (among other things) on (i) the methods of production employed, and (ii) the organizing and managing ability of the farmer, and (e) the conditions determining the returns to the farmer which are required to secure stability of production. Consequently, the estimated net revenue for any parcel of land will depend upon the assumptions regarding each of these conditions; and the validity of any classification based on net revenue will depend on the reasonableness of the assumptions made. These matters are discussed in the paragraphs which follow.

Choice of Product.—Land in any particular situation might conceivably be used for a number of alternative purposes, that is, for the production of any one (or several) of a number of products; but the net revenue from these various

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(1) This may be illustrated as follows:

Gross Revenue			$2,500
Production Costs:			
Feed and Seed used on the Farm		$500	
Operating Expenses		$1,000	
Upkeep of Equipment		$300	
Farmer's Earnings:			
Cash	$400		
Perquisites	$200		
		$600	
Total Costs			$2,400
Net Revenue			$100

As the Gross Revenue includes the value of produce used on the farm, and of perquisites, the above statement could be reduced to

Sales of Farm Produce		$1,800
Production Expenses:		
Operating Expenses	$1,000	
Upkeep of Equipment	$300	
Farmer's Cash Earnings	$400	
Total Expenses		$1,700
Net Revenue		$100

uses would probably be different. With, in each case, the appropriate organization of the producing unit any form of production might cover total production costs. The choice, if the most advantageous use is sought, would depend not on the relative gross productivity, but upon the relative net productivity (net revenue) per unit of land.

When the classification is determined on the basis of the product which, in general, over the whole area, offers the prospect of the largest net revenue, marginal land is then marginal in relation to this use, and some of the land defined as submarginal on this basis might be marginal or above the margin for some other use.

Prices.—The method of classification on the basis of estimated net revenue involves a problem of price anticipation. However, any decision regarding the use of land, if it can lay claim to being a reasoned decision, must reflect some price expectation. The problem of price anticipation is not uniquely associated with the method of classification outlined here. But it is probably the most difficult problem to be faced. Annual prices over a period of years cannot be predicted with assurance of any great accuracy.

Although yearly fluctuations in prices of particular products are not without their significance, if land is being classified for permanent settlement, it is the long-run level of prices which may be considered to be relevant. While marked fluctuations occur from year to year, and prices remain relatively high or low over several consecutive years, such variations tend to take place around a 'normal' level. The process of averaging annual prices will give an approximation to the 'normal' level; provided that there is no persistent tendency to a change in the 'normal'. Where such tendencies are recognizable the most reasonable prediction of future prices will take account of them. On the other hand, if no trend in prices can be established, the safest procedure may be to assume that prices in the future will correspond closely to levels experienced in the past. These considerations apply not only to the prices of farm products but also to the things which the producer uses in production.

In determining the level of past prices it is important, first, that this should be based on a period long enough to include years, or sequences of years, of high and low prices; second, that the price used should be the net price in the area; and, third, that the quotations selected should be those of the grade or quality of the product characteristic of the area of production.

Output per Unit of Land.—In areas in which the farm unit to be used in estimating net revenue is not less than 160 acres, the unit of land may be taken to be the quarter-section. Under western Canadian conditions, this is the legal unit in which transactions customarily occur. The gross production from any quarter-section will then depend on the physical characteristics of the land, that is, soil type, topography, stoniness, erosion, alkalinity, waste land, and other features; the climatic conditions, including rainfall, temperature, wind, hail, and frost; and the farm organization and methods of production, as these are determined by the character of the land, prices, known techniques, and the skill of the farmer.

In the dry areas, the relatively permanent and stable characteristics of the land in each quarter-section have been broadly described in the soil surveys. The scattered meteorological records indicate that there is some significant local difference both in the level of climate, and the degree of annual variation experienced. While this may not be susceptible to proof, the most reasonable assumption may be that future climate will, in the long-run, resemble closely the climate of the past. But this is not known for individual parcels; and even if it were, it would be impossible to estimate productivity in terms of land and climate alone. Scientific knowledge of the relations between soil, weather and output has not yet reached the point where accurate predictions of yields can be made

merely by measuring these factors. Obviously any such estimate would necessarily involve assumptions regarding methods of production.

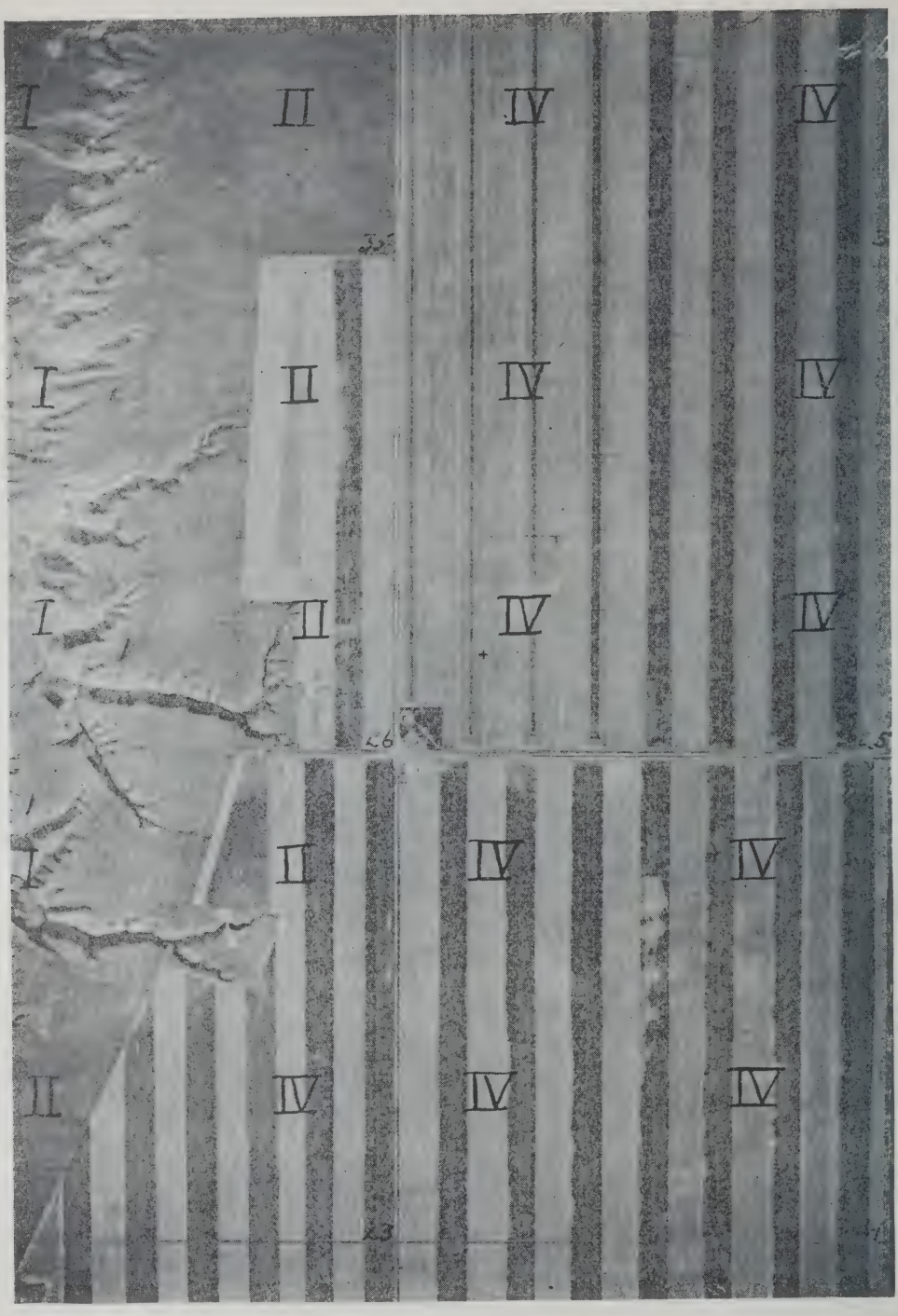
These considerations suggest that the most reliable guide to future yields may be the yields which have been experienced in the past under similar conditions. The combined effect of soil, climate, and past methods of production is reflected in the yields which have been obtained. Assuming that the soil character remains the same, that future climate is similar to past climate, and that methods of production do not greatly change, it may be expected that yields over a period in the future will be reasonably accurately indicated by past yields. This may ultimately prove wrong. Soil character, climate, plants and live stock, and particularly the methods of production may change; but unless some clear evidence of the direction of these changes is available, it would appear safest to assume that future yields will be similar to those of the past.

The yields which have been secured from any particular parcel of land are influenced by the particular physical features, and the particular methods

PLATE 4. Impediments to Cultivation.
Drifting Sand. North of Atlee. Tilley East, September 1939.

employed by farmers of varying ability. The yield which would appear to be most appropriate for classification is that which could be secured, under the particular physical conditions, by typical methods of production applied by farmers of typical ability. If records of yields are grouped on the basis of the predominant soil type of the parcels, the average of each of these groupings would give a long-run yield for each soil type, with average other physical characteristics including climate, and with average methods of production, that is, for farmers of average skill. These yields would then provide a measure of the level of yields which might be expected from parcels of land of any particular soil type in the same area. The total output from the parcel would be affected by the proportion of the crop land which is cropped each year under typical methods of production.

Typical yields for soil types would however obscure the effects of differences in the significant physical features of particular parcels. In relation to individual quarters such yields would provide only a first approximation from which adjustments would be necessary to make allowance for recognizable differences



Royal Canadian Air Force Photograph

PLATE 5. Strip Farming on Class IV Parcels in Bow West. Twp. 11; Reg. 19. Vertical Photograph.

in topography, stoniness, evidence of drifting, condition of land generally, and climatic factors. At this stage judgment is unavoidable, and adjustments should be made only after careful inspection in the field, due consideration being given to the distinguishing features of particular parcels.

Size of Farm Unit.—Total revenue, total cost, and the difference between these will depend on the area of land included in the farm unit. A farmer of given ability, operating on a small area of land of given fertility, might be unable to secure revenue sufficient to cover all costs including adequate earnings for himself. Up to a point the inclusion of a larger area in the farm unit would result in economies of production, increasing the revenue relative to costs. The optimum size is affected by the physical productivity of the land, the product (or products) being produced, techniques of production, prices, and the ability of the farmer to operate successfully on a large scale.

In relation to this part of the problem the estimate of net revenue must be based on typical conditions. Again, unless there is clear evidence of a persistent trend in the typical, it would seem most reasonable to assume that the size of farm observed to be representative in the area is the optimum size for the typical producer, for the particular form of production, under prevailing or anticipated conditions.

If the margin is defined on this basis, then a producer of typical ability, securing this area of marginal land without payment for its use, could expect to obtain the level of returns already referred to as sufficient to induce continuity of production. Any producer capable of operating a larger unit successfully could, if he secured the land on the same terms, derive from the larger unit additional returns which he would be able to retain for himself.

Methods of Production—It would be an error to base the estimate of net revenue on the assumption that the best known methods will be everywhere employed. Few producers could meet this condition. Further, although it is reasonable to suppose that, with the passage of time, improved techniques will become known to farmers and be adopted by them, the nature of these improvements and the adjustments they will call for, cannot be predicted. Consequently, the reasonable procedure would appear to be to assume that the methods of the future will be similar to those actually in force at the moment. This assumption is involved in the measurement of output on the basis of average yields. On the side of costs, typical methods may be indicated by measuring costs in terms of an average of actual budgets for farms of typical organization. With the adoption of this procedure, farmers operating on any given class of land and employing 'better-than-typical' production techniques would secure for themselves the benefits resulting from their superior skill.

Ability of the Farmer.—Ability is related to output per unit of land, size of farm, and methods of production. Indeed ability can only be measured objectively by the manner in which the individual adjusts the various factors of production, and by the earnings secured. In the approach already outlined, typical ability would be provided for by assuming average output per unit of land, as well as by the assumptions of representative farm organization and techniques of production. When the classification is so determined, relatively capable farmers, securing land on the terms indicated by the classification, would be able to make and retain additional returns attributable to superior ability.

Farmers' Returns.—It has been argued that the 'condition of stability implied that the farmer, after meeting the necessary expenses of production, could obtain for himself returns which would induce him to continue production without contraction or expansion. These returns were referred to as 'sufficient'. It has also been suggested that the classification should be based on the assump-

tion that the land is to be used by a typical farmer. The problem presented at this stage is the determination of the returns measured in money terms, which would be considered 'sufficient' (in the above sense of the term) by a typical farmer.

The difficulties need no elaboration, and there would be no point in attempting to minimize them. It must, however, be pointed out that this problem is not one presented exclusively by the method of classification on the basis of estimated net revenue. If the decision as to whether land can or cannot be profitably used for a particular form of production has to be made by someone other than the individual farmer himself, the problem cannot be evaded, no matter what method of classification is followed. Some judgment would be implicit in any scheme of classification; it is perhaps a virtue of the net revenue method that the decision on this point, as on other relevant issues, must be made explicit.

One possible procedure is to base this element of cost on the level of returns which farmers have obtained in the past, that is, the long-run returns rather than those secured either in periods of expansion or contraction. While there is merit in this suggestion, it would still be open to question whether the securing of this level of returns would be consistent with long-run stability. Alternately, as the employment opportunities of many farmers are substantially limited to hired work on farms, or unskilled urban employments, it might be contended that farmers would continue production as long as they obtained returns equal to those of unskilled urban workers. This is not entirely satisfactory. Even assuming that the employment alternatives available to farmers are so limited, if the long-range view of permanent settlement is taken, the problem is not confined to the present generation of farmers. The question remains whether new farmers would present themselves in sufficient numbers to replace the present generation, if no greater returns could be secured than those received by farm workers or unskilled labourers.

The difficulties associated with this point suggest that, rather than settle on a definite figure, it would be preferable to introduce a range of returns. This would mean, that subject to the other assumptions, marginal land would be defined as land which might be expected, in the absence of any payment for the use of the land, to provide returns within the designated range. In any event it is obviously essential that, in the interpretation of the classification (and in relation to its practical applications) the fullest consideration should be given to the assumptions regarding farmers' returns.

Summary.—It is apparent that the technique of estimating net revenue has to meet three types of problem, which, however, would have to be met under any reasoned procedure of classification. *First, the problem resulting from variability and uncertainty of weather conditions and prices from year to year in the future.* In the absence of evidence indicating a persistent trend, the reasonable procedure is to assume that, in the long-run, the future conditions of weather and price will be similar to the conditions experienced in the past. This involves the use of long-run averages of yields and prices. *Second, the problem resulting from differences in the physical characteristics of particular parcels of land and local differences in climate.* With respect to major differences, for example, soil type and tillable acreage, particular parcels may be treated separately. In relation to other factors, for example, differences in topography, stoniness, and drifting and differences in the climatic factors associated with particular parcels, the initial classification may require to be based on the assumption of typical conditions. This involves the use of average yields for different soil types, and the application of these to the tillable acreage. The approximation secured in this way may later be adjusted for particular parcels, on the basis of apparently significant differences as these are disclosed by careful inspection of each parcel. At this point judgment is clearly unavoidable. *Third, the problem of organiza-*

Royal Canadian Air Force Photograph

PLATE 6. Topographical Break in an Area of Class IV Parcels.
Twp. 24; Rge. 2. Acadia Valley. Vertical Photograph.

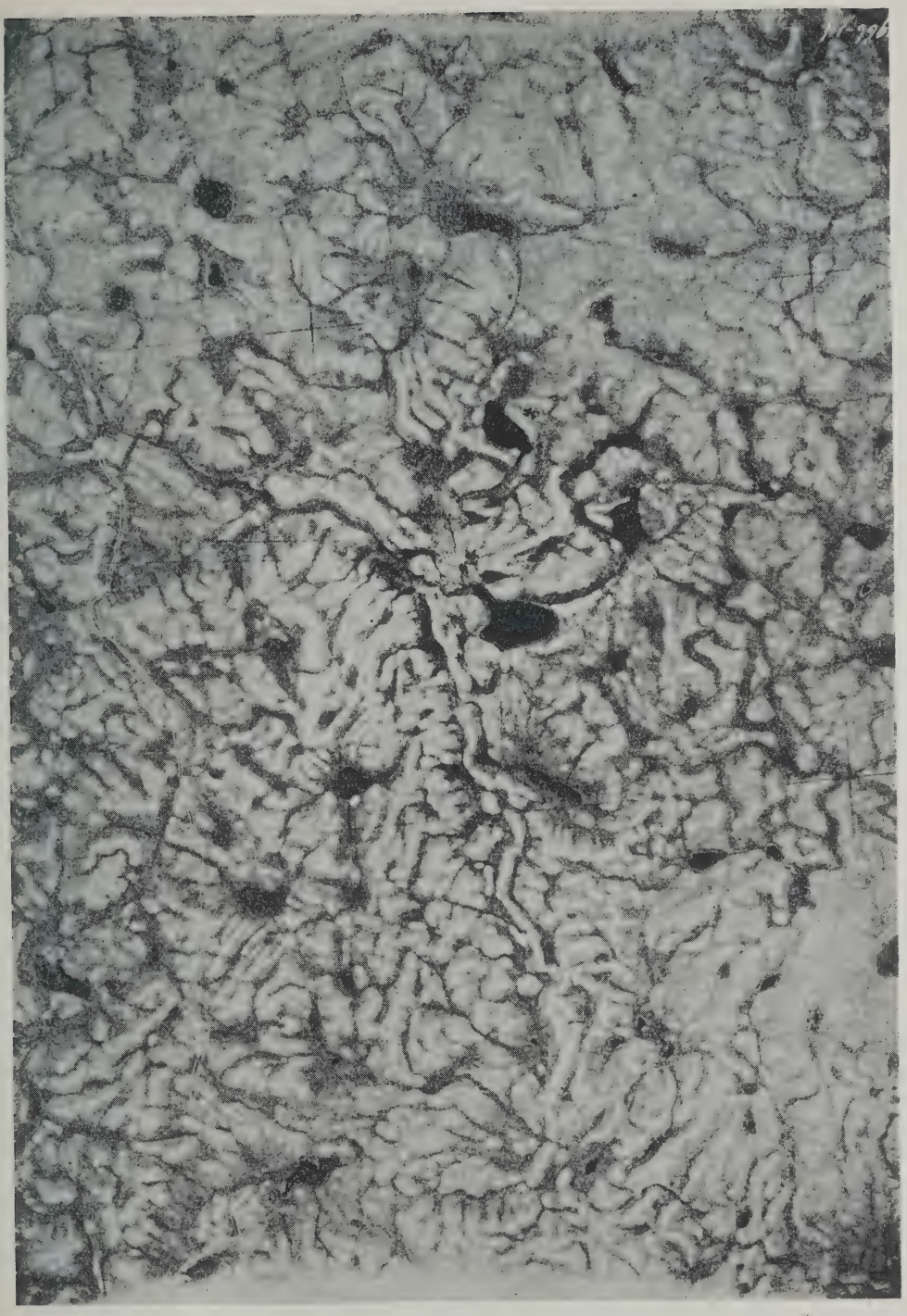
tion and management of the farm enterprise, which are associated with the varying abilities of individuals. The reasonable procedure is to assume typical ability, typical size of farm, and typical farm organization and methods of production; the 'typical' in each case being determined by observation. These conditions are implied in the use of average yields and the average proportion of cultivated land cropped annually; in the adoption of the typical size of farm for the particular area; and in the application of a typical budget of costs based upon the actual operations of farmers. Where the estimated net revenue is based on representative conditions, individuals securing land on the terms implied by the classification, and organizing and operating the farm more effectively would be able to secure and retain for themselves additional revenue, which would represent a return to their superior management. Farmers, operating less efficiently than the typical producer, would, it is true, be unable to secure the level of returns provided for in the classification.

Some Problems of Interpretation.—The intelligent interpretation and use of a classification depends upon the most careful consideration of the logic of the method employed. The preceding discussion has therefore been designed to emphasize the nature of the assumptions underlying land use classification and to suggest what appear to be the most reasonable assumptions on which to base any procedure of classification. It may, however, be necessary to refer to one or two points which might lead to misinterpretation of a classification determined as suggested.

There is no conceivable procedure whereby land could be classified for use in general. Even if use could be determined on the basis of relative gross productivity, and assuming that a significant common denominator could be found for different physical things, it would still be true that species and varieties of plants (and animals) respond differently to the same physical environment and the same intensity of culture, and that the same plant responds differently to variations in environment and culture. Classification must be based on a specified use of land. But the selection of a specific form of production does not destroy the practical significance of the classification, provided the selection is consistent with the realities of the situation in the area being classified. It has been suggested that the classification should be based on the typical form of production. Further, the classification of land as submarginal for the specified purpose, does not mean that such land has no profitable use. It may be marginal or above the margin for some other, though less intensive, use.

It should be apparent from the earlier discussion that the classification of land as submarginal does not mean that it is impossible to use this land for the stated form of production, and to secure from it a scale of living similar to that which it is claimed could be secured from marginal or better land. The term submarginal should be interpreted as implying that this would be possible only if the methods of production or size of farm were better than typical. Even then, farmers who are capable of this degree of efficient operation would probably be better off farming more productive land.

The classification of land as marginal or submarginal means that payment for the use of this land might be expected to be possible, in the case of a typical farm unit operated with typical efficiency, only by reducing the long-run earnings of the farmer below the specific amount allowed for farmers' returns. Thus the classification has certain implications regarding the position of farmers at present established on marginal or submarginal land. However, it must be emphasized that the problem of classification of land for use is, in important respects, distinct from the problem of past agreements and contractual obligations. The method of classification proceeds, as it were, on the assumption that the land is not in use, and that farmers are considering the contracts and payments they should make in connection with securing the land. The method does not provide for a complete appraisal of particular farm properties; but a satisfactory classification



Royal Canadian Air Force Photograph

PLATE 7. Land Class I. Too Hilly to Farm.
Twp. 19; Rge. 6. Tilley East. Vertical Photograph.

might be expected to result in future land transactions taking place on terms more nearly consistent with the capacity of the land to pay, than has been the case in many instances in the past.

The classification is based upon net income derived from average yields and prices over a long period, relative to costs of production and family living. If in any given year or period of years, the price of wheat is higher or lower relative to cost, the net income will vary accordingly. In that particular year or series of years, the income from a given parcel of land may suggest a higher or lower classification than that accorded it. It is necessary therefore to emphasize the long-run nature of the classification. Yearly or periodic variations in relationship are thus taken into account and further, the results will not be affected by a long-time change in prices unless the relationship between the price of wheat and the prices of things entering into costs of production and family living, changes.

PART III

LAND CLASSIFICATION IN THE SPECIAL AREAS AND ROSENHEIM AND ACADIA VALLEY

THE AREA SURVEYED.—The territory surveyed and classified includes all of the Special Municipal Areas, and two smaller blocks of land not included in the Special Areas. At the time the field surveys were made (1935-39) the Special Areas included six large administrative units, formed in each case by the combining of several municipalities and improvement districts. The particular Areas were Neutral Hills, Sullivan Lake, Sounding Creek, Berry Creek, Tilley East, and Bow West (1). The location and boundaries of these Areas are indicated in Figure 1. The additional territory surveyed consists of the Municipality of Acadia Valley, Municipal District No. 241, situated at the southeast corner of the Sounding Creek Area, and six townships in the Municipality of Rosenheim, Municipal District No. 361, situated at the northeast corner of the Neutral Hills Area (2).

DEVELOPMENT OF THE SURVEYS.—The field work and analysis involved in the classification of this territory has extended over the period 1935 to 1940. During that time, as a result of experience acquired, some changes in technique have been made. However, for the preparation of the land classification map included in this report, uniform methods have been applied over the entire area. So far as the land classification is concerned, the results are comparable for all Areas included in the map. (Figure 10).

The original survey was conducted in an area centered around the towns of Vulcan and Lomond. A portion of this territory falls within the Bow West Area, which was formed after 1935. In the Vulcan-Lomond survey emphasis was placed on the study of existing land use, farm organization, tenure conditions, and settlers' progress. A classification of land was not attempted. A report on this survey has already been published(3).

The Sounding Creek Area and Acadia Valley were surveyed in 1936. In this study special attention was directed to the classification of land for use. The method of classification adopted involved the zoning of areas of land within which the relevant characteristics (soil, topography, land use, assessed values) were generally similar. These zones were then grouped into classes. In this classification the block or zone, rather than the quarter-section, was the unit. Zones, and therefore land classes, included quarters with significantly different characteristics. A preliminary report on this survey was published in 1938(4).

In the survey of the Neutral Hills and Sullivan Lake Areas and Rosenheim (1937) the emphasis on classification was retained. However, the technique of classification was modified. In the new method, which involved the estimating of net revenue as a preliminary step, the unit was the quarter-section. Aerial photographs were first made available for this survey. Preliminary land classification maps of the two areas were prepared, and a limited number were distributed.

The same general method of classification was adopted for the Berry Creek and Tilley East Areas which were surveyed in 1938. In 1939, the 'zone' classi-

(1) For further information regarding the organization and administration of the Alberta Special Municipal Areas see Appendix A.

(2) Since the preparation of this report these six townships have been included in the Special Areas.

(3) "An Economic Study of Land Utilization in Southern Alberta", G. H. Craig and J. Coke. Publication 610 Technical Bulletin 16, Dominion of Canada, Department of Agriculture, issued July, 1938.

(4) "Classification of Land, Sounding Creek Special Area, Alberta". Preliminary Report, Dominion of Canada Department of Agriculture, issued June, 1938.

FIGURE 1. Location of Areas.

fication of the Sounding Creek Area and Acadia Valley was adjusted to conform to the classification in other Areas; and classification was carried out in the Bow West Area. During the same summer a thorough check was made of the preliminary classification for the whole territory. The principal purpose of the re-checking was to assure that uniformity had been secured in the various portions of the territory surveyed.

Sources of Data.—The data applied in the classification of parcels, and supplementary data secured, were obtained from a number of different sources.

Inspection of Parcels.—During the surveys each parcel of land was inspected. In most cases inspection was made from the road allowances, the parcels being traversed only where there seemed to be special need for this. Field records of the characteristics of the parcels were made. These notes included information on the location and condition of buildings. Information on physical characterisitcs, if not already provided in the required form by the Soil Surveys, was also recorded.

Interviews with Farmers.—All but a negligible proportion of the farmers, resident in the territory at the time of the surveys, were interviewed. The data secured in this way related to size of farm, tenure of land, land use, farm inventories, indebtedness, relief, farm receipts and expenses, and yields of wheat obtained over a period of years.

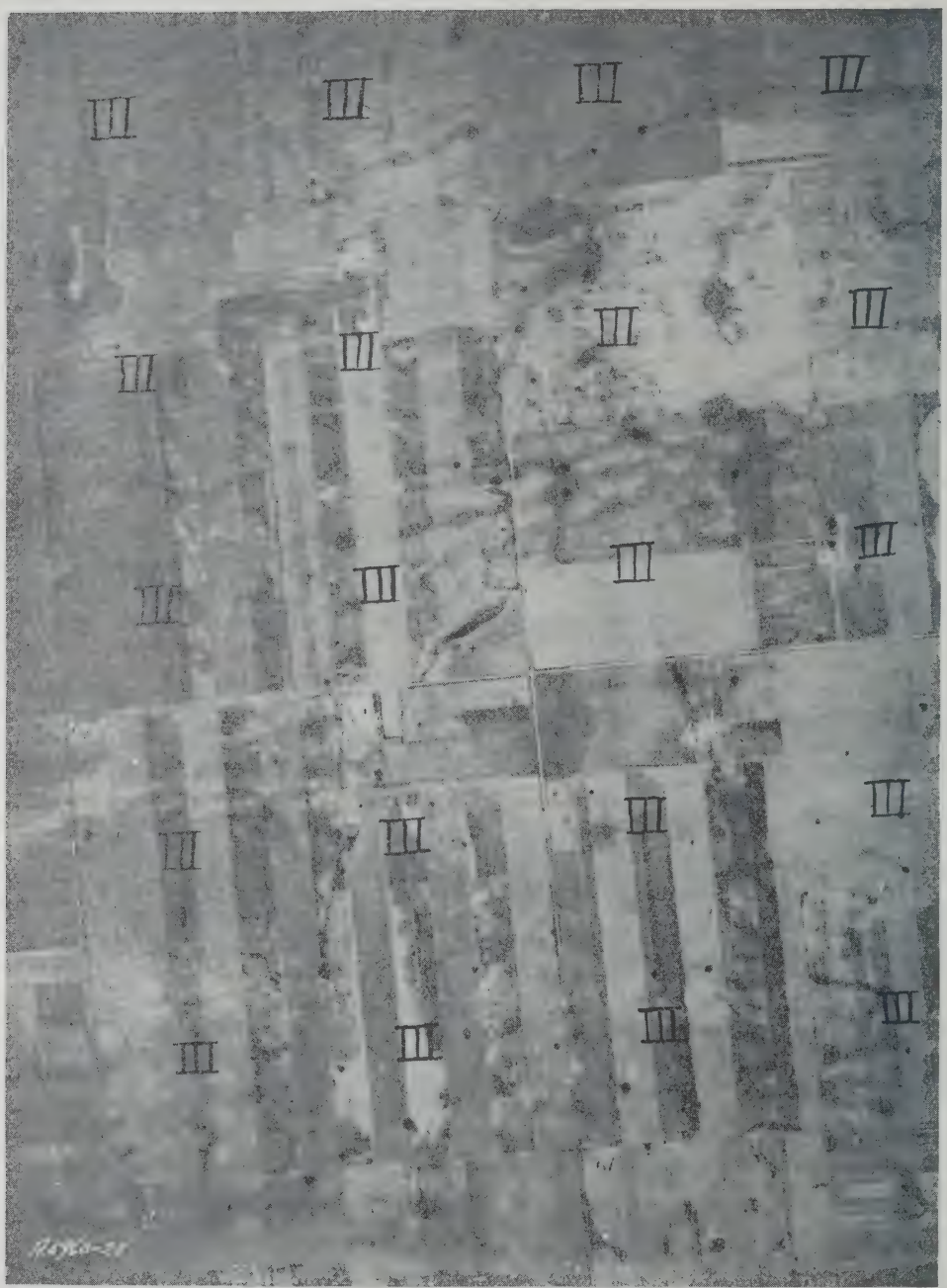
Municipal Offices.—Certain information was secured from municipal offices, covering previously organized municipalities, or from departments of the Provincial Government, covering improvement districts. This information included data on ownership of particular parcels, assessed values, assessed acreage, tax arrears, and relief advances.

Soils Surveys.—Information regarding certain physical features of particular parcels was obtained from published reports or soil sheets, or from unpublished material compiled by the Soils Department, University of Alberta. The Soil Type and Topography Maps included in this report are based entirely on the records of the Soils Surveys.

Aerial Photographs.—Since 1937, aerial photographs have been made available through the co-operation of the Royal Canadian Air Force, and the Bureau of Geology and Topography, Department of Mines and Resources. These photographs have been used for measuring the acreage of broken, cultivated, and tillable land in particular parcels; for determining the location of buildings; and for checking the preliminary classification.

Other Sources of Data.—Other information, for example, prices, wages, and the proportion of cultivated land under wheat were secured from official publications including the Canada Year Book, Census of Canada, and the Monthly Bulletin of Agricultural Statistics. Information on feed requirements, used in the construction of the budget, was obtained from the Department of Animal Husbandry, University of Alberta.

Method of Classification.—The process of classification involved two main steps: first, the determination of a preliminary classification based on estimated net revenue, and second, the modification of this preliminary classification after further consideration of the peculiarities of individual parcels. The relatively extended discussion of the first of these steps, in the paragraphs following, may suggest that the procedure of adjustment involved in the second step was of only minor importance. This is not so. The peculiar contribution of the preliminary classification was to establish a uniform basis on which to compare parcels in widely scattered areas with significantly different general features. But important adjustments were necessitated by reason of the



Royal Canadian Air Force Photograph

PLATE 8. Class III Parcels in the Hilda District.
Twp. 18; Rge. 1. Tilley East. Vertical Photograph.

particular features of parcels, where these features were not adequately allowed for in the preliminary classification.

Preliminary Classification.—The determination of a preliminary classification involving the estimating of net revenue proceeded through three stages: first, the determination of a gross productivity rating for each quarter-section, based on yields for the soil type of the parcel, and the acreage of tillable land; second, the converting of this measure of gross physical productivity into terms of estimated net revenue, using prices and a budget of costs; and, third, the classification of parcels on the basis of certain ranges of estimated net revenue.

Determination of Gross Productivity Rating.—The land in the surveyed area is used for two main purposes, namely, wheat growing and grazing of live stock. The characteristic organization of farm enterprises provides that in years of 'normal' yields the bulk of the revenue comes from wheat. The classification was therefore based on a typical, relatively specialized, wheat-producing farm unit, and indicates the suitability of land for this form of production.

In determining the potential productive capacity of each parcel of land, if used for wheat production, the estimate was based on the acreage of tillable land (that is land which could be ploughed); the productivity of the soil type in association with climatic, biological, and other factors, in terms of wheat; and the typical methods of production. A measure of the acreage of tillable land in each quarter was obtained from the record of land use, the evidence of the aerial photographs, and field inspection of the parcels. The measure of soil productivity was derived from records of wheat yields. Wheat yield records were grouped according to the predominant soil type of the cultivated acreage on individual farms. Long-run average yields were then calculated, for the period 1921-36 (Sounding Creek, 1922-35). These averages represent the long-run yields for each soil type, with typical climate and other physical features, and with typical methods of production(1). The acreage of the main crop harvested each year depends on the tillable acreage, farming techniques and the combination of enterprises. It was found from the Seventh Census of Canada that approximately 45 per cent of the cultivated acreage in the Areas under study was sown to wheat. The remainder of the cultivated land is normally summer-fallowed, or used for coarse grains. The probable annual production of wheat for any parcel was secured by applying the yield per acre for the soil type to 45 per cent of the tillable acreage. It was assumed that the remainder of the land would be summer-fallowed, or used to provide feed for live stock. Actually, as a short-cut to the determination of net revenue, a deduction of 1½ bushels was made from the long-run average yield per acre of wheat, to allow for seed and waste. This eliminated the necessity of including the seed in the cost budget. The productivity figure obtained consequently represented the probable annual production of marketable wheat for the particular parcel.

Estimating Net Revenue.—The probable net revenue depends upon the estimated gross revenue and the production costs; but both these must be based on a certain size of farm. In the surveyed area the most common size of farm was found to be the half-section (320 acres); the average size of farm approximately 3½ quarters (540 acres). The three-quarter-section farm unit (480 acres) was taken as typical of wheat-producing farms in these areas; and this size of farm was assumed in determining the net revenue.

As already indicated, a detailed farm management survey was made in the Vulcan-Lomond area in 1935; and farm management and financial data were secured in subsequent surveys. Using the information for farms of three-quarter-sections, in the Vulcan-Lomond area, Neutral Hills and Sullivan Lake,

(1) For further information on Wheat Yields, see Section on Wheat Yields, Part IV, p. 40.

average receipts and expenses were calculated. To provide the budget used for measuring net revenue, certain adjustments were made to the actual budgets. It was assumed that the farm family would provide sufficient labour to operate the farm, with a small amount of assistance at harvest; that with members of the family working out at harvest-time, for example, exchanging labour, revenue equivalent to one-third of the total threshing cost would be secured from this source; that only horse-power would be used, and that the horses and other live stock would be maintained with the coarse grains and hay produced on the farm.

The revenue side of the budget included the value of sales of live stock and live stock products adjusted to the average prices for the period 1921-36; the receipts from threshing labour referred to above; and the value of the estimated annual production of marketable wheat based on a price of 92c for No. 2 Northern, at Hanna, Alberta, that is, the average price for 1921-36. In this way the budget revenue for particular parcels was made to conform to the long-run level of prices for farm products in this district.

On the cost side, the budget expenses were derived from the actual average expenses by adjusting these to the long-run prices for the goods and services used in connection with production. A depreciation allowance was based on the average value of buildings and equipment for three-quarter-section farms, the rates used being buildings 5 per cent, equipment 7 per cent. Alternative values were introduced for the farmer's returns; a low value of $585, representing the equivalent of the average wages and board for hired men in Alberta over the period 1921-36; and a high value of $891, representing the equivalent of the average cash living expenses (including half the cost of operating a car) as disclosed by survey data. It should be noticed that both these values are measures of cash returns. They do not include the value of the farm contributions to family living in the form of produce consumed. The accounting procedure adopted excludes these items from both sides of the budget(1).

Classification by Estimated Net Revenue.—In relation to the classification of land, the central point is the margin, that is, the grade of land which will produce no net revenue, estimated gross revenue being equal to costs. For the purpose of the classification a range of earnings of from $585 to $891 was admitted. To meet the resulting range in costs, a range of productivity would be required. Consequently any land which it was estimated would provide gross revenue sufficient to secure earnings of from $585 to $891 was classified as marginal. In the case of submarginal land, estimated gross revenue is less than costs (negative net revenue). As the lower limit of marginal land was based on earnings of $585, any land which it was estimated would not provide sufficient gross revenue to secure earnings of $585 was classified as submarginal. Supra-marginal land is that grade of land which will produce positive net revenue, gross revenue being in excess of costs. As the upper limit of the margin was based on earnings of $891, any land providing for estimated gross revenue sufficient to secure earnings of $891 and a balance of net revenue was classified

(1) The application of the budget may be indicated by an illustration, showing the determination of the net revenue for land with an estimated annual production of marketable wheat of 600 bushels per quarter, using the high value for the farmer's earnings. For further detail on budget see Appendix B.

Revenue:		
1,800 Bushels Wheat at 92¢	$1,656	
Live Stock and Produce Sales	187	
Threshing Labour	77	
Total Revenue		$1,920
Costs:		
Farm Expenses	$665	
Depreciation	135	
Farmer's Returns	891	
Total Costs		$1,691
Net Revenue:		$ 229

as above the margin. Actually the classification was extended to distinguish between classes of supra-marginal land. At this level of productivity there is no essential basis of distinction, and the points of separation between classes

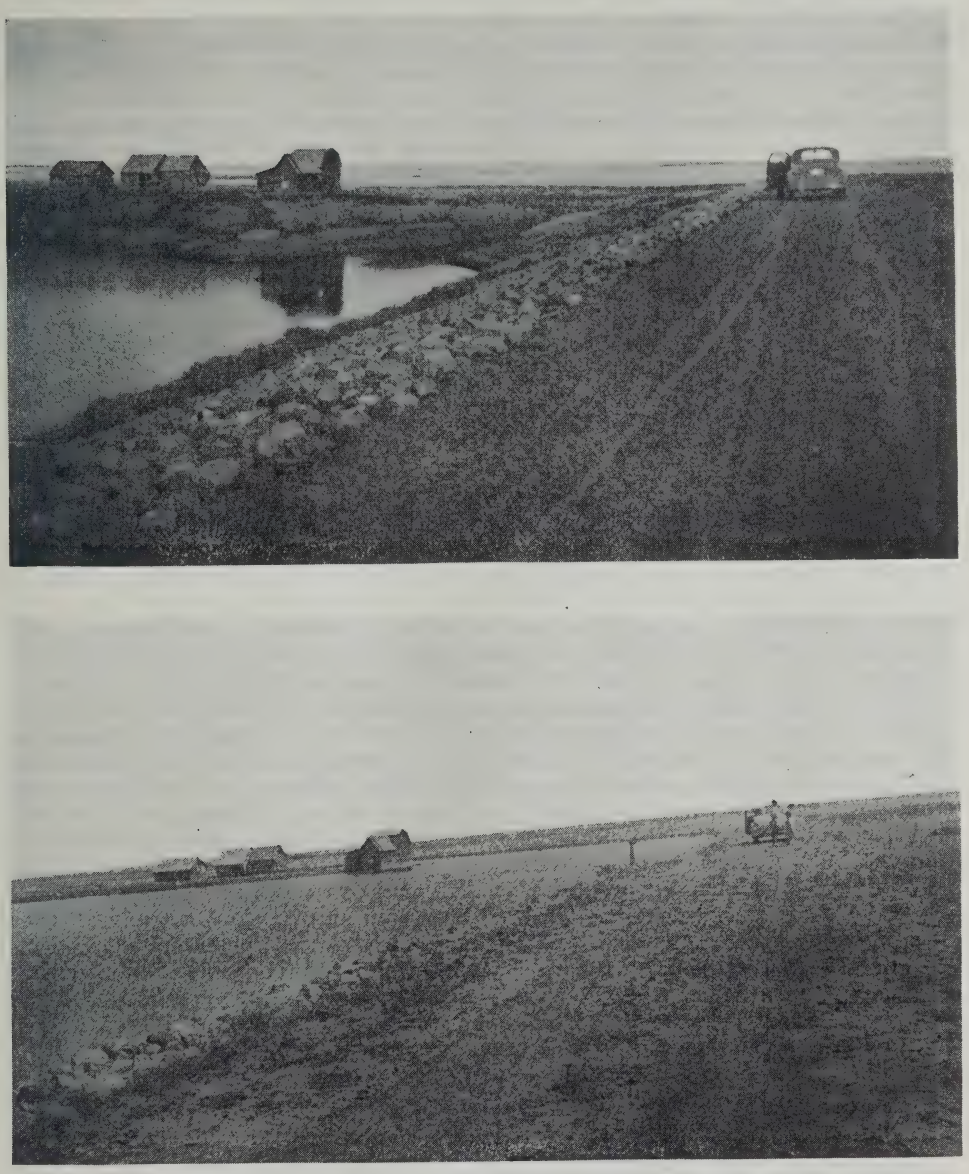


PLATE 9. Water Conservation. Bartman Dam. Pollockville. Berry Creek.
Above Bartman Dam. October 1939.
Below Bartman Dam. July 1940.

of supra-marginal land are therefore necessarily arbitrary. In addition to the submarginal and marginal classes (Classes I and II), two classes of more productive land were recognized in the area surveyed. Land Class III included

all parcels providing estimated net revenue up to $237; all parcels providing estimated net revenue of more than $237, and less than $411 were included in Land Class IV(1).

Since the classification is based upon suitability for wheat production, it seems desirable to indicate the limits of the land classification in terms of estimated bushels of wheat available for sale per quarter-section. On this basis, parcels of Land Class I are those which produce less than 375 bushels for sale annually per quarter-section; parcels in Land Class II may be expected to produce 375-517 bushels of wheat for sale per quarter-section; parcels in Land Class III may be expected to produce between 518 and 795 bushels per quarter-section and those in Land Class IV produce from 796 to 999 bushels of wheat for sale per quarter-section. The classification provides a uniform basis on which to compare parcels in widely separated districts with significantly different general features.

Final Classification.—The classification of parcels resulting from the application of the technique outlined above provides no more than a first approximation. It may be repeated that, while this procedure is of considerable value in providing a uniform base for classification over a wide varied area, it may be necessary to adjust the preliminary classification of particular parcels. The reasons for such adjustments, which have been noted previously(2), may be re-stated here.

Adjustment of Preliminary Classification.—Under the method employed, the productivity rating of particular parcels was arrived at by the use of long-time average yields. To obtain these averages the yield records were grouped according to the predominant soil type of the cultivated acreage on each farm. Consequently, the yield applied in determining the productivity, and classification, of a parcel of any soil type, represents a yield for that soil type with average conditions of topography, stoniness, erosion, climate, and other physical features. But the physical characteristics of any particular parcel of a given dominant soil type are not likely to be average in any, or all, respects. Significant divergences from the average in topography, stoniness, and erosion can be recognized. Similarly, although the scanty meteorological data make it difficult to provide statistical proof, evidence is not lacking that climatic conditions vary throughout the area surveyed. Consequently, parcels which are relatively rough, stony, or eroded, or which are subject to relatively unfavourable weather factors, will tend to be too highly rated by the net revenue method employed in the preliminary classification. On the other hand, the method would not give sufficient weight to favourable topography, and absence of stones or erosion. Where there is considered to be sufficient evidence that the climatic conditions in particular localities are more favourable than is general throughout the area, some enhancement of the rating would be justified, with the result that the parcels might be placed in a higher land class than indicated in the preliminary classification.

The effects of these variations from typical conditions cannot be accurately measured. Adjustments in the preliminary classification should reflect carefully considered judgments. In arriving at the final classification presented in the Land Classification Map (Figure 10) adjustments were based on three types of evidence. First, during the course of the field work notes were made on the topography, stoniness and degree of erosion of individual parcels, and evidence of more or less favourable climatic conditions in some local situations was

(1) This basis of determining Land Classes III and IV was employed in order to secure comparability with similarly designated classes for Saskatchewan. In connection with Land Classification surveys in the Province of Saskatchewan the distinction between Classes III and IV had already been determined in relation to the productivity of certain Saskatchewan soils. For more detailed reference to the method followed in determining the preliminary classification, see Appendix B.

(2) Part II, pp. 17-18.

recorded. After the preliminary classification was completed, the productivity rating and classification of particular parcels was checked against this information. Second, in addition to the field notes, the aerial photographs provided evidence of peculiar characteristics of particular parcels. The photographs were found particularly useful in the comparison of adjacent quarters, and in indicating the lines at which natural breaks, that is, points at which changes in physical features, occurred. Third, after the completion of the preliminary classification, some field checking was undertaken in the following year. Special attention was given to those situations where office adjustments, on the basis of notes and photographs, had been made.

Checking the Classification.—The assessed values indicate the relative position in which the local assessor would rate particular parcels. Attention was therefore given to the assessed values of contiguous parcels, and where the classification appeared to be in marked conflict with the judgment of the assessor, such situations were scrutinized and noted for later examination in the field. Preliminary classification maps were circulated among agricultural field men, municipal officers, and others, and comments were sought. The suggestions made by persons familiar with the various localities were noted, and the situations referred to were given special attention in the final field checking. During the summer of 1939, two members of the staff re-examined the entire area surveyed. Particular consideration was given to those localities and parcels where the earlier classification was in doubt; and the covering of the area in one season made it possible to check the extent to which uniformity over the entire area had been attained. The classification approved after this re-examination appears in the Land Classification Map (Fig. 10).

Interpretation of the Land Classification Map.—The Land Classification Map, and the classification of each parcel shown on it, must be interpreted in the light of the method of classification adopted, and of the assumptions on which the method is based.

Summary Definition of Land Classes.—Any attempt at summary definition of the different classes must overlook important qualifications which can only be recognized when the method of classification is understood. The following definitions of the classes appearing in the Land Classification Map are offered subject to this precautionary statement.

Land Class I: This Class includes parcels which, without payment for their use, could not reasonably be expected, if used in a specialized wheat-producing unit, to provide, over a period of years, sufficient cash revenue to meet operating expenses, provide for depreciation, and enable the farmer operating on a three-quarter-section farm to secure cash earnings equivalent to the long-run wages and board of a hired man, that is, $585. The estimated bushels of wheat available for sale from these parcels is less than 375 bushels per quarter-section. Such land may be considered unsuitable for wheat production; and is defined as submarginal for this use. Land which cannot be expected to sustain wheat production might better be used for grazing.

Land Class II: This Class includes parcels which, without payment for their use, could reasonably be expected, if used in a specialized wheat-producing unit, to provide, over a period of years, sufficient cash revenue to meet operating expenses, provide for depreciation, and enable the farmer operating a three-quarter-section farm to secure cash earnings between the level of wages and board for a hired man and the level of past cash family living expenses of farm families, that is, between $585 and $891, the estimated bushels of wheat available for sale from these parcels ranging from 375 to 517 bushels per quarter-section. Such land may be considered marginal for wheat production, in the sense that it might be expected, in the long-run, to provide returns to the farmer sufficient

to induce continuity of production. However, owing to the high variability of yields in this territory, the use of marginal parcels for specialized wheat production would seem to involve a considerable element of risk. Consequently Class II parcels might better be used under an organization of production combining wheat growing with the production of live stock along extensive lines, that is, in a combined wheat-growing and grazing unit.

Land Class III: This Class includes parcels which if used in a three-quarter-section, specialized wheat-growing unit, could reasonably be expected to provide the farmer with the same returns as at the upper limit of Class II, that is, returns considered sufficient to induce continuity of production, and leave net revenue ranging from $1 to $237 per quarter, the estimated bushels of wheat available for sale ranging from 518 to 795 bushels per quarter-section. Such land may be considered suitable for wheat production. Some payment could be made for its use without reducing the farmer's earnings below the level procurable from Land in Class II.

Land Class IV: This Class includes parcels which if used in a three-quarter-section, specialized wheat-growing unit, could reasonably be expected to provide the farmer with the same returns as at the upper limit of Class II, that is, returns considered sufficient to induce continuity of production, and leave net revenue ranging from $238-$410 per quarter, the estimated bushels of marketable wheat available for sale per parcel in this land class ranges from 796 to 999 bushels per quarter. Such land may be considered suitable for wheat production. Larger payments could be made for its use, than for the use of Class III parcels, without reducing the farmer's earnings below the level procurable from land in Class II.

Some Problems of Interpretation of the Land Classification Map.—Some general problems of the interpretation and use of a land classification were referred to in an earlier section[1]. Some additional points arising out of the specific technique of classification adopted in this study may be noted. These will serve to emphasize the importance of an understanding of the procedure followed.

In any locality where a relatively small proportion of marginal land is found dispersed among submarginal land, it cannot be supposed that settlement based upon cultivation of the marginal land would be able to support the customary level of community services. This follows from the fact that, in the budget of costs, only average taxes were included. Where settlement was relatively sparse, the attempt to raise locally sufficient revenue to maintain the same services as provided in more densely settled areas might have the effect of making the land submarginal.

Again, where an individual quarter shown as Class II land is surrounded by land classified as submarginal (Land Class I) it cannot be supposed that this quarter, by itself, or along with any of the adjacent land, can be profitably used in a farm unit organized for wheat production. It is clearly implied in the method of classification that this quarter is classified as marginal because a farm unit of three closely similar parcels might be expected to provide adequate returns to the farmer provided that no payment was made for the use of the land.

Again, the classification of parcels as submarginal does not mean that there are no circumstances under which it would be profitable to cultivate any of the land in these parcels. Some of the quarters are classified as Class I because of a relatively small proportion of tillable land; but this small acreage may consist of relatively fertile land. In certain situations it might prove advantageous to include such parcels in a wheat-producing unit; cropping the tillable land and using the uncultivated land for pasture.

(1) Part II, p. 33.

The Land Class Pattern in the Area Surveyed.—The general land class pattern in the area surveyed is that of a substantial core of Land Class I with an approach to higher land classes at the boundaries (Fig. 10). The basic factors responsible for this transition in the grade of land will be discussed in Part IV. At this point it is sufficient to notice that there is a progressive decrease in the number of parcels in the higher land classes.

The outstanding feature of the area surveyed is the large proportion of the parcels, roughly 80 per cent, classified as submarginal for wheat production (table 1 and Fig. 10). The conclusion that so large a part of the territory must be considered as suitable only for grazing will not surprise those familiar with this part of the province. The area contains what has long been recognized as the most arid part of the Prairie Provinces. The history of the area has demonstrated the extremely hazardous nature of cereal production under the climatic conditions to which it is subject. The attempt, even prior to the recent series of drought years, to reorganize the administrative units and readjust the use of land, was a recognition on the part of the provincial authorities of acute problem conditions. Further evidence that the agricultural limitations of much of the land have been already recognized is found in the proportion of the land, particularly in certain large portions of the area, which has never been cultivated or which has been abandoned for many years(1).

Marginal parcels (Land Class II), representing 14 per cent of all parcels in the surveyed area, are generally dispersed, although substantial concentrations are found in certain locations. These characteristically marginal areas are found in the Bow West Area, where a solid block of Class II parcels indicates considerable uniformity; south of Consort (Twp. 35, Rge. 6)(2) in the Neutral Hills Area; and north and east of Hanna (Twp. 31, Rge. 14) in the Sullivan Lake Area. A smaller concentration occurs south of Empress (Twp. 23, Rge. 1) and Bindloss (Twp. 22, Rge. 2) in the Tilley East Area. Marginal parcels are dispersed throughout the Sounding Creek Area; and there are relatively few, scattered Class II parcels in the Berry Creek Area.

Less than 5 per cent of the parcels in the surveyed area are classified as Class III. Relatively large amounts of this Class occur in Rosenheim and Acadia Valley. Within the Special Areas, the main areas where Class III parcels predominate, are found north of Consort and again north of Throne (Twp. 36, Rge. 9) in Neutral Hills; east and south of Hanna in Sullivan Lake; and in the Hilda district of Tilley East (Twps. 17 and 18, Rges. 1 and 2). A small block occurs south of Sheerness (Twp. 29, Rge. 12), lying partly in each of the Sullivan Lake and Berry Creek Areas. Other concentrations of Class III parcels are found adjacent to areas of Land Class IV; for example, in the Bow West Area.

The area contains very little Land Class IV. Excluding the Bow West Area, Rosenheim and Acadia Valley, there are only 73 parcels so classified. The main concentrations of this class are found in the three units referred to, but even here the proportions are small, ranging from 6.6 per cent in Bow West to 10.0 per cent in the six townships of Rosenheim municipality. Other locations in which Land Class IV occurs are south of Altario (Twp. 31, Rge. 1) in Neutral Hills; west of Hanna in Twps. 29 and 30, Rge. 16 in Sullivan Lake; north of Sibbald (Twp. 28, Rge. 1) in Sounding Creek; and east of Drumheller (Twp. 28, Rge. 18) in the west corner of Berry Creek. There are no Class IV parcels in the large Tilley East Area.

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(1) Section on Land Use, Part IV, p. 52.

(2) If a town is indicated the location given refers to the township in which the town is situated; otherwise the township or townships in which the land class concentration occurs, is given.

TABLE 1.—DISTRIBUTION OF LAND CLASSES BY AREAS

Area	Land Class									
	I		II		III		IV		All Land Classes	
	No. of Parcels	Prop. All Parcels in Area	No. of Parcels	Prop. All Parcels in Area	No. of Parcels	Prop. All Parcels in Area	No. of Parcels	Prop. All Parcels in Area	No. of Parcels	Prop. All Parcels in Area
		%		%		%		%		%
Neutral Hills	4,541	70.08	1,212	18.70	700	10.80	27	0.42	6,480	100.0
Sullivan Lake	3,969	75.00	941	17.78	357	6.75	25	0.47	5,292	100.0
Sounding Creek	7,537	80.32	1,747	18.62	86	0.91	14	0.15	9,384	100.0
Berry Creek	7,534	94.14	372	4.65	90	1.12	7	0.09	8,003	100.0
Tilley East	12,465	88.32	1,199	8.50	449	3.18	——	——	14,113	100.0
Bow West	3,177	60.10	1,319	24.95	442	8.36	348	6.59	5,286	100.0
Special Areas	39,223	80.78	6,790	13.98	2,124	4.37	421	0.87	48,558	100.0
Rosenheim	522	60.42	121	14.00	135	15.63	86	9.95	864	100.0
Acadia Valley	943	56.43	318	19.03	255	15.26	155	9.28	1,671	100.0
Surveyed Area	40,688	79.63	7,229	14.15	2,514	4.92	662	1.30	51,093	100.0

PART IV

CHARACTERISTICS OF THE AREA AND OF THE LAND CLASSES

The method of classification adopted in this study has been set out in Part III. The basis of the method is the estimate and comparison of the net productivity of particular parcels. The land classification map displays the results of the classification process. The purpose of this part of the report is to describe the area in terms of various factors associated with net productivity, and to indicate the relation between these factors and the final land classification. This may serve the double purpose of presenting a more detailed description of the resources and characteristics of the territory surveyed; at the same time providing supporting evidence of the reliability of the classification.

The important relation between physical factors and net productivity (net revenue) has already been emphasized(1). Topography, soil type and yield per acre are *important determinants of net productivity;* and of the present classification of parcels. During the course of the survey information was gathered on other features of the area which, while not determinants of net productivity, and therefore not used in arriving at the classification, might reasonably be considered to be associated with the net productivity of land. These characteristics include the present use of land; the extent of abandoned or idle land and abandoned buildings; the density of present settlement; the condition of farm buildings; the ownership and tenure of land; assessed values; tax arrears; prices paid for land; and mortgage indebtedness. The relation between these and net productivity is rarely a simple one; but, in most cases, these features might be assumed to be affected by, *or to provide evidence of net productivity of land.*

The general procedure in this section is to deal first with the physical factors causally connected with net productivity, and which have been used in the determination of the land classification; and second, with the various features which may be supposed, in greater or less degree, to reflect net productivity. As far as the nature of the data will permit, the discussion in each section follows a consistent pattern. Reference is made first to the sources, methods of collection, and methods of presentation of the data. This is followed by a general description of the area in terms of the particular feature. A brief analysis of the way in which each feature might be supposed to be related to the productivity of land precedes a discussion of the observed relation between the characteristic and the classification determined in this study. In some sections reference is made to particular points which would appear to be of special significance in relation to the problem of adjustments within the area.

The discussion of relations is supported by reference to maps and statistical tables. Wherever possible, particular features of the area have been mapped; and a number of maps are included at the back of the report. These maps may be expected to serve three purposes. First, they assist materially in the broad description of the area. Second, they help to establish the relations between particular features and the land classification. Finally, the individual maps make it possible to secure a description of the different features, varying in permanence and significance, of each individual parcel.

TOPOGRAPHY.—The Topography Map (Fig. 2) was prepared from information provided by the Alberta Soils Surveys(2). The table is based on a count

(1) p. 32.

(2) For information on the basis of classification, see the various reports published by the Department of Soils, University of Alberta.

of the parcels falling within particular topographical classifications. (Table 2). Where topographical boundaries passed through individual parcels, these parcels were classified on the basis of the predominant topography of the quarter.

Approximately 60 per cent of the parcels in the surveyed area were classified as level to gently rolling; and 24 per cent as rolling. This suggests that over the large part of the territory topography is not a serious limiting factor to cultivation. However, many of the parcels in level sections of the area are traversed by creeks and coulees, the eroded banks constituting an impediment to cultivation, and, in many cases, reducing appreciably the acreage of tillable land. Although a high proportion (66%) of Bow West is level to gently rolling, other parts of this Area are too hilly to farm (Twps. 18 and 19; Rge. 19). About 32 per cent of Neutral Hills is described as rolling or hilly, and in some sections the land is too hilly to farm (e.g. Twp. 35; Rge. 2). East and south of the level plain, in the Sounding Creek and Tilley East Areas, the land becomes generally rolling and in places hilly. In the latter Area 33 per cent of the parcels are classified as rolling and 20 per cent as hilly. The Hand Hills at the western extremities of the Berry Creek and Sullivan Lake Areas consist of an elevated plateau on which arable farming is possible, although many quarters are cut by coulees and draws. The fertility of the soil in this region is high, (See sections on Soil Types and Wheat Yields).

Topography may have an important influence on the productivity of land. In some locations the land may be so rough as to render it untillable, and parcels containing land too hilly to farm have less than 160 acres of tillable land. In other situations where the topography is not so rough as to make cultivation physically impossible, the gross productivity of the land may still be adversely affected by loss of moisture through run-off, and by water erosion. Topography may also affect net productivity through its influence on production costs. Except in the case of land which is untillable, the effect of topography on productivity is difficult to measure, and judgment cannot be avoided in making allowance for this factor.

While topography is an important factor determining productivity, its influence in particular situations may be offset by its association with other factors. A rolling quarter of silt loam may be more productive than a level quarter of fine sandy loam. Or again, a parcel which has a significant area of untillable land may still be more productive than another parcel all of which is tillable, if the first parcel consists of a more fertile soil type. Considerations of this kind suggest that it would be unreasonable to expect any complete correlation between topography and land class.

TABLE 2.—RELATIONSHIP OF TOPOGRAPHY AND LAND CLASS

Type of Topography	Land Class				All Land Classes
	I	II	III	IV	
	No. of Parcels	No. of Parcels	No. of Parcels	No. of Parcels	No. of Parcels
Level to Gently Rolling	23,363	4,815	1,667	600	30,445
Rolling	9,289	2,100	782	58	12,229
Hilly	4,831	232	65	4	5,132
Eroded	3,205	82	—	—	3,287
Total	40,688	7,229	2,514	662	51,093

Some relation between land class and topography is evident from the data in table 2. Only four of the parcels included in Class IV, or less than 1 per cent, have less favourable topography than that described as level, gently rolling or rolling; and 97 per cent of all parcels in Class III fall into these categories. On the other hand, 94 per cent of the hilly and 98 per cent of the eroded parcels

have been classified as submarginal for wheat production (Class I). Certain situations in which the land class is clearly affected by topography can be observed from the map (Figure 2). A concentration of Class III parcels in the Hilda district, Tilley East, (Twps. 17 and 18; Rges. 1 and 2) corresponds with an area of level land. The break in the area of Class IV parcels in Acadia Valley (Twps. 24 and 25; Rge. 2) is associated with rough topography and erosion. In Neutral Hills, areas of rough and hilly land are associated with concentrations of Class I parcels (Twps. 35, 36 and 37; Rges. 7 and 8; and Twp. 35; Rge. 2).

Soil Type.—The Soils Map (Fig. 3) was prepared from the Soils Sheets of the Alberta Soils Surveys(1). These surveys have been in progress for a number of years, and over the period some changes in soil classification have been made. In general these modifications have led to a finer, more detailed classification. The territory discussed in this report covers portions of seven soil sheets; the earliest survey being made in 1924, the latest in 1939. Under the guidance of representatives of the Alberta Soils Surveys, a regrouping of soil types was effected which resulted in substantial uniformity of classification over the whole territory. This classification is shown in Figure 3. For tabulation (table 3) the parcels were grouped on the basis of this uniform classification.

The actual boundaries between soil types frequently cross particular parcels. In the detailed reconnaissance surveys conducted in Alberta the soil type boundaries are drawn by inspection from the road allowances. Consequently, no claim of complete accuracy is made for the position of the soil line within particular parcels. It may be necessary to point out also that, particularly in regions of varied physical features and mixed soil types, detailed soil surveys involving the traversing of parcels might appreciably modify the description of the soil characteristics of individual quarters. Subject to these qualifications which indicate the limitations of the available soils information for classification of quarter-sections, the description provided by the detailed reconnaissance surveys may be considered a reasonably accurate indication of the soil type of individual parcels. For purposes of analysis parcels cut by the soils lines were grouped on the basis of the predominant soil type.

TABLE 3.—RELATIONSHIP OF SOIL TYPE AND LAND CLASS

Type of Soil	Land Class I	Land Class II	Land Class III	Land Class IV	All Land Classes
	No. of Parcels	No. of Parcels	No. of Parcels	No. of Parcels	No. of Parcels
Waste:	3,099	—	—	—	3,099
Brown:					
Mixed	1,384	78	14	1	1,477
Sands	7,559	179	10	—	7,748
Blow-out Loams(2)	7,395	810	149	—	8,354
Loams	15,075	3,686	878	7	19,646
Heavy Loams	2,438	1,107	316	143	4,004
Clays	442	82	135	163	822
Dark Brown:					
Mixed	68	1	—	—	69
Sands	696	109	39	3	847
Blow-out Loams(2)	602	193	63	—	858
Loams	1,689	784	634	154	3,261
Heavy Loams	209	193	262	186	850
Clays	32	7	14	5	58
Total	40,688	7,229	2,514	662	51,093

(1) See various reports published by the Department of Soils, University of Alberta. The reports covering the surveyed area are indicated in the inset on Figure 3.

(2) A soil type is classed as 'blow-out' in areas where patches of top-soil have been removed by erosion, thus exposing a hard subsoil. These patches, which are of irregular shape may vary from a few square feet to several square yards in area. There may be few or many of them in a given area of land. Blow-out soils are described in greater detail in the various soils survey reports which are distributed by the Department of Extension, University of Alberta.

The surveyed territory lies mainly in the brown soil zone. The boundary between the brown and dark brown zones passes through the area in the west and north. It will be understood that there is no precise break between these zones; they merge into one another, with a substantial belt representing a transitional condition. Consequently, the line of demarcation, indicated in the inset on the Soils Map (Fig. 3), while based on the best available information, is necessarily somewhat arbitrarily determined. Excluding non-agricultural land (waste), 88 per cent of the parcels are in the brown zone and 12 per cent in the dark brown. Tilley East, Sounding Creek, and Acadia Valley lie entirely in the brown zone, and only a small section at the western end of Berry Creek is in the dark brown zone. Roughly one-quarter of each of Bow West and Neutral Hills, one-third of Sullivan Lake, and all of Rosenheim are in the dark brown zone.

The darker colour of the dark brown zone indicates higher organic content, reflects heavier precipitation, and, in general, implies more fertile land. The concentrations of Land Class IV occur at the periphery of the area surveyed, that is, in the dark brown zone, with the exception of the heavy-textured soil in Acadia Valley. The proportion of parcels (excluding waste) in the dark brown zone increases from 8.8 per cent in Class I to 52.6 per cent in Class IV.

The soil type classification portrayed in the Soils Map is based largely on soil texture; although texture is not disassociated from other soil characteristics affecting productivity. Sixty-seven per cent of the parcels consist entirely or predominantly of medium-textured loams, including the solonized, or 'blow-out' phase. There is also an appreciable proportion of sandy soils. Eighteen per cent of the parcels were classified as consisting of sands. On the other hand, parcels including the heavier-textured soils (heavy loams and clays) represent 12 per cent of all parcels of agricultural land in the area. Sands are distributed over the territory, substantial areas occurring in Bow West, Tilley East, and in the northwest corner of Sounding Creek. 'Blow-out' loams are confined almost entirely to Tilley East, Berry Creek, Neutral Hills, and Sullivan Lake. Two thirds of the parcels in Berry Creek were classified as consisting of 'blow-out' loams. About 90 per cent of the heavy soil parcels are in Bow West, Tilley East, Sounding Creek, and Acadia Valley.

The method of classification adopted in this study would be expected to result in a close correspondence between land class and soil type, provided the average yields for the different soil types were significantly different,[1] and that other physical features, for example, topography, were not such as to offset the effects of soil type. Reference was made in the section on Topography to situations in which this factor clearly affected the final classification. It will also be evident that, in the absence of other physical differences, each of the broad land classes might include a number of soil types. This is particularly true of the submarginal class (Class I), which would include all soils below a given level of fertility.

A significant relation between land class and soil type is evident both from the maps and from the statistical data. Class I parcels (excluding waste) consist mainly of sands, solonized loams, and loams (87.8%); Class II of solonized loams, loams, and heavy loams (93.7%); Class III of loams and heavy loams (83.1%); and Class IV of heavy loams and clays in the brown zone (Acadia Valley) and loams and heavy loams in the dark brown zone (97.6%).

Wheat Yields.—Official yield data are, unfortunately, quite inadequate for the purpose of classification of land. Consequently during the course of the surveys an effort was made to secure, from the farmers resident in the area, statements of wheat yields over as long a period as possible. Special emphasis was placed on statements covering the period 1921-36.

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[1] See Section on Wheat Yields below.

It should be unnecessary to stress the difficulties in the way of securing a sample of yield records which could be considered reliable both on grounds of accuracy and of representativeness. Few farmers retain accurate records of crop yields and, in most cases, the survey enumerator was forced to rely on the memory of the farmer. Records were taken only from those farmers who seemed to be in a position to give reliable estimates. Every effort was made to secure yield figures which represented the output per seeded acreage for the land under wheat in any year. No attempt was made to distinguish between yields from different fields or parcels, or between summer-fallow and stubble crops. To the extent that farmers in the dry areas remember their yields in terms of total acreage, this procedure simplified taking of records. Experience suggests that the farmers in the dry areas retain an unusually clear recollection of yields in particular years. This may be due to the marked variations in yields. Years of high yields as well as years of low yields are impressed on the farmers' memories.

Difficulty was also encountered in securing a sample so distributed as to provide adequate numbers of records for different soil types. In areas of abandonment and sparse settlement there were relatively few farmers from whom reliable records could be obtained. Throughout the whole territory a significant proportion of the resident farmers had moved into the area during the years of expansion between 1925 and 1929; while others had changed farms within the area during recent years. These farmers were unable to give data covering the entire period required for the determination of the long-run averages (1921-36). Finally, owing to the limited extent of the more fertile soils, the number of farmers operating on these soils is not great, and consequently only small samples covering these soils could be obtained.

In spite of these difficulties, experience and the analysis of the yield data suggest that the averages obtained may be used with some confidence for the purpose of preliminary classification. While no significance should be attached to individual records, there is marked consistency in the manner in which individual series record years of high, intermediate, and low yields. The relations between the averages for the different soil types conform to reasonable expectations based on general knowledge of the relative fertility of these soil types. There is significant consistency, within the limits to be expected, between results from surveys in different areas, carried out at different times and by different enumerators. The material included in this section may serve to provide some evidence of the reliability of the yield data used for the preliminary classification.

The outstanding features of wheat yields in the area surveyed are the relatively low long-run level and the high degree of variation from year to year. These features are illustrated in the accompanying charts and tables. (Charts 1-3 and tables 4-9).

TABLE 4.—WHEAT YIELDS PER ACRE FOR CANADA, ALBERTA, AND AREA SURVEYED BY PERIODS 1921-36, 1921-28, AND 1929-36

	1921–36	1921–28		1929–36		
	Bus.	Bus.	% 1921–36	Bus.	% 1921–36	% 1921–28
Canada(1)	15.1	18.0	119	12.1	80	67
Alberta(1)	16.9	19.0	112	14.8	88	78
Surveyed Area(2)	10.4	14.6	140	6.2	60	42

(1) From data in Canada Year Books.

(2) From Survey Records. For number of records and yields by years see Appendix C.

The average annual output for the surveyed area, as determined by the survey records, was 10.4 bushels for the period 1921-36 (table 4). This was only slightly more than two-thirds of the comparable figure for the whole of Canada, and about 60 per cent of the average for the province of Alberta. Some indication of the relative variability of yields can be secured by comparing the averages for the comparatively wet period of 1921-28, with the averages for the dry period, 1929-36. For the area surveyed the average of the latter period (6.2 bushels) was less than half that for the preceding 8 years. This relative decline was substantially greater than the decrease for Canada or for the province of Alberta.(1) Annual variations in yields may be compared from Chart 1.

Soil Type and Wheat Yields.—As indicated above, wheat yields were not secured for parcels or fields, but for farms. In many cases the farm units included varied types of soil. For the analysis of wheat yields by soil types, the farms were grouped on the basis of the predominant soil type of the cultivated land. The yields for the farms representing each group were then averaged to get a representative yield for the soil type.

TABLE 5.—WHEAT YIELDS BY ZONES AND SOIL TYPES, 1921-36(1). SURVEYED AREA

Soil (Texture) Type	Average Yield 1921–36		Yield as Per Cent Medium to Heavy		Yield as Per Cent Same Texture in Brown Zone
	Brown Zone	Dark Brown Zone	Brown Zone	Dark Brown Zone	Dark Brown Zone
	Bus.	Bus.	%	%	%
Medium to Heavy	11.9	15.4	100	100	129
Medium	11.3	12.6	95	82	112
Light to Medium	9.0	10.6	76	69	118
Medium (Solonized)	9.1	9.4	76	61	103
Light	8.3	8.5	70	55	102
All Soil Types	9.9	11.3	83	73	114

(1) Sounding Creek 1922–35.

The yields shown in the accompanying tables (tables 5 and 6) represent quite broad soil-type groupings. The soil types included in the various groups are as follows: Medium to Heavy Textured Soils—silt loams and clay loams; Medium Textured Soils—loams and very fine sandy loams; Light to Medium Textured Soils—fine sandy loams and sands. Yields were also calculated for solonized ('blow-out') soils. The texture of these ranged from very fine sandy loam to silt loam.

The average yields recorded for the various soil types may be considered to provide a reasonably accurate description of the relative productivity of different soils in the area, under prevailing methods of wheat production. The following relations between soil and wheat yields are apparent in the data in tables 5 and 6, and are illustrated in Chart 2.

(1) Yields are generally higher in the dark brown than in the brown soil zone; average yields for the various soil texture types are consistently higher in the dark brown zone. For example, the average yield, 1921-36, for light to medium soils was 10.6 bushels in the dark brown and 9.0 bushels in the brown soil zone (table 5).

(2) Yields from some soil types in the brown soil zone are higher than yields from some soil types in the dark brown zone. For example, the average yields

(1) It should be noted that the Canadian and provincial averages include the output of the surveyed area. Further, the average Canadian yield, by including the output of areas subject to different climatic influences, obscures the degree of variation to be found in other producing areas. Similar local compensations occur within the province of Alberta.

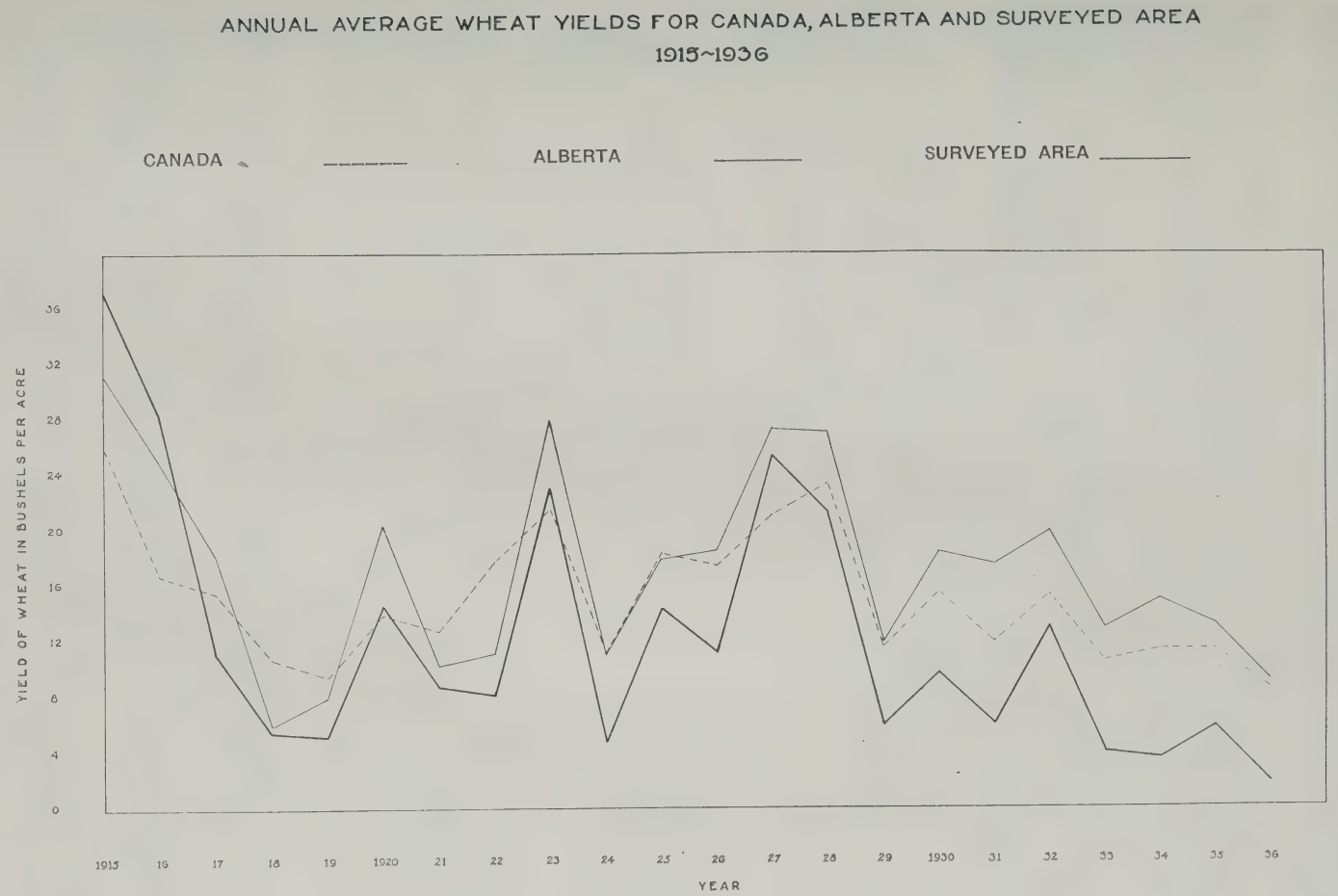

CHART 1. Annual Average Wheat Yields for Canada, Alberta and Area Surveyed

for medium to heavy soils in the brown zone is 11.9 bushels; the average yield for light soils in the dark brown zone is 8.5 bushels (table 5). This condition implies that any general statement regarding the relative fertility of soils in the two zones must be qualified by reference to soil texture.

(3) Yields from the heavier-textured soils are higher than those from the lighter-textured soils. Excluding the solonized soils, the average yields, in both soil zones, increase consistently from the light to the heavy-textured soils. For example, in the dark brown zone, the range of yields is from 8.5 bushels for light soils to 15.4 bushels for medium to heavy soils (table 5).

(4) The effect of texture on yield is greater in the dark brown than in the brown zone; there is a greater difference between yields from the heavy-textured soils in the two zones, than between the yields from the light soils. Thus, the yield from medium to heavy soils in the dark brown zone is 29 per cent higher than the yield from the same soil types in the brown zone; the difference between the yield from light soils is only 2 per cent (table 5).

TABLE 6.—WHEAT YIELDS FOR VARIOUS SOIL TYPES BY PERIODS, 1921–36, 1921–28, 1929–36[1]. AREA SURVEYED.

	1921–36	1921–28		1929–36		
	Bus.	Bus.	% 1921–36	Bus.	% 1921–36	% 1921–28
Brown Zone						
Medium to Heavy	11.9	16.6	139	6.8	57	41
Medium	11.3	15.8	140	6.7	59	42
Light to Medium	9.0	11.8	131	5.9	66	50
Medium (Solonized)	9.1	13.5	148	4.8	53	36
Light	8.3	12.4	149	4.4	53	35
All Soil Types	9.9	14.0	141	5.7	58	41
Dark Brown Zone						
Medium to Heavy	15.4	20.6	134	6.8	44	33
Medium	12.6	16.6	132	8.0	63	48
Light to Medium	10.6	13.5	127	7.0	66	52
Medium (Solonized)	9.4	12.2	130	6.2	66	51
Light	8.5	12.3	145	4.9	58	40
All Soil Types	11.3	15.0	133	6.6	58	44

[1] Sounding Creek 1922–35, 1922–28, 1929–35.

(5) Variations in yields, measured by comparing the average long-run yield (1921-36) with the averages for a wet period (1921-28) and a dry period (1929-36), are substantial in both soil zones, and all soil types (table 6).

Land Class and Wheat Yields.—In determining average yields for different land classes, the farms from which yield records were obtained were grouped according to the predominant land class in the farm unit, having regard to the distribution of cultivated land. The long-run average yields (1921-36) obtained in this way are shown in table 7. While these averages are given by Areas it is not intended that any significance should be attached to the differences between the averages for particular Areas. The data are presented in this way only to show that the relation between land class and yield is similar in all Areas. Annual average yields by land classes are shown in Chart 3.

TABLE 7.—AVERAGE WHEAT YIELDS BY AREAS AND LAND CLASSES. 1921–36[1]
AREA SURVEYED.

	Land Class								All Land Classes
	I		II		III		IV		
	Bus.	% Class II	Bus.	% Class II	Bus.	% Class II	Bus.	% Class II	Bus.
Neutral Hills[2]	9.9	92	10.8	100	13.0	120	14.4	133	11.5
Sullivan Lake	9.2	84	9.8	100	11.4	116	14.9	152	9.5
Sounding Creek[3]	10.7	89	12.0	100	14.8	123	14.5	121	11.6
Berry Creek	8.1	79	10.2	100	11.3	111	—	—	8.7
Tilley East	9.1	88	10.3	100	12.6	122	—	—	10.3
Bow West	7.8	74	10.5	100	13.0	124	15.3	146	10.8

(1) Sounding Creek Average 1922–35.
(2) Including 6 townships in Rosenheim.
(3) Including Acadia Valley.

It will be clear from the earlier discussion of method that the land class within which any particular parcel falls is not determined solely by the yield per acre of cultivated or cultivable land, or by the physical factors affecting yield per acre of tillable land. The other principal determinant of gross productivity per parcel is the proportion of tillable land, and as this is unlikely to be inversely related to the fertility of the soil which can be cultivated, a significant direct relation between land class and yields, as these have been computed, is to be expected. Such a relation is apparent from the data in table 7. The average yield increases from Land Class I to Land Class IV. There are, however, situations in which the factor of physical arability is so important as to offset the fertility of the tillable land. This is well illustrated in the case of Land Classes III and IV in Sounding Creek. Parcels in these classes are located in the heavy soil area in Acadia Valley. The average yield for Class IV is slightly lower than the yield for Class III, although the difference is not significant. The explanation of this condition is, that some parcels having relatively high yields but low proportions of tillable land were not sufficiently productive to be included in Land Class IV.

For purposes of measuring variability of yields the average yield for each year, and for each land class, was calculated from records covering the year. These averages were taken as the representative yields for each year, and for each land class. The dispersion of these annual yields was then computed, the measures employed being the Standard Deviation and the Coefficient of Variation. The Standard Deviation is a measure of absolute variation and is therefore expressed in bushels.(1) The Coefficient of Variation is a measure of relative variation and is expressed as a percentage.(2)

The values of these measures of dispersion by land classes (and areas) are shown in table 8. There is apparently a significant relation between land class and annual variation in yields. The absolute variation (S.D.) increases from Class I to Class IV(3). This means that producers operating on the higher land classes are likely to be subject to somewhat larger variations in yields, if variations are measured in bushels. On the other hand, the relative variation (Coefficient of Variation) appears to decrease from Class I to Class IV, implying

(1) The Standard Deviation is the square root of the sum of the squares of the deviations of the annual yields from the mean of the series.

(2) The formula for the Coefficient of Variation is $\frac{\sigma}{M} \times 100$, where σ = Standard Deviation and M = the mean of the series, in this case the long-run average yield.

(3) The numbers of records for Class IV are too small to provide significant results.

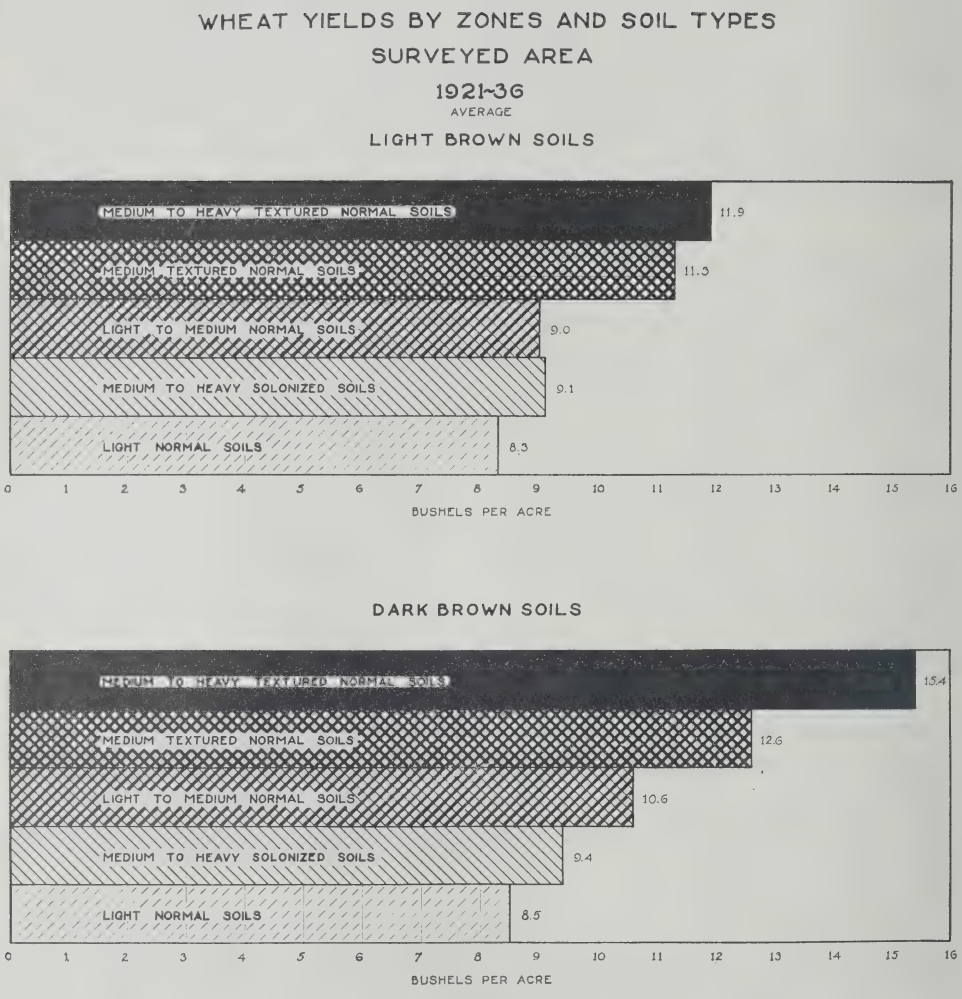

CHART 2. Wheat Yields by Zones and Soil Types, Surveyed Area.

that producers on the higher land classes are likely to be subject to smaller variations in yields, when variations are measured as proportions of long-run averages.

TABLE 8.—VARIABILITY OF WHEAT YIELDS BY AREAS AND LAND CLASSES 1921–36. (1) SURVEYED AREA.

	I		II		III		IV		All Land Classes	
	S.D.(4) bus.	C.V.(5) %	S.D. bus.	C.V. %	S.D. bus.	C.V. %	S.D. bus.	C.V. %	S.D. bus.	C.V. %
Neutral Hills(2)	8.5	72	7.3	68	7.7	59	9.0	63	7.4	64
Sullivan Lake	5.9	72	6.9	70	7.2	63	7.8	52	6.4	67
Sounding Creek(3)	7.9	74	8.6	72	8.9	60	8.6	59	8.2	71
Berry Creek	6.6	81	7.0	69	7.8	69	—	—	6.7	77
Tilley East	7.7	85	8.2	80	9.4	75	—	—	8.2	80
Bow West	7.3	93	9.0	85	8.0	62	5.5	36	8.4	78
Surveyed Area	7.3	80	7.8	74	8.2	65	7.7	53	7.6	73

(1) Sounding Creek 1922–35.

(2) Including 6 townships in Rosenheim.

(3) Including Acadia Valley.

(4) Standard Deviation.

(5) Coefficient of Variation.

TABLE 9.—WHEAT YIELDS BY AREAS AND LAND CLASSES(1) BY PERIODS, 1921–36, 1921–28, AND 1929–36(2). SURVEYED AREA.

Area	1921–36	1921–28		1929–36		
	Bus.	Bus.	% 1921–36	Bus.	% 1921–36	% 1921–28
Land Class I						
Neutral Hills(3)	9.8	14.7	150	5.5	56	37
Sullivan Lake	8.7	12.2	140	4.5	52	37
Sounding Creek(4)	10.5	14.5	138	6.0	57	41
Berry Creek	8.1	12.4	153	3.9	48	31
Tilley East	9.1	13.0	143	5.5	60	42
Bow West	8.5	11.3	133	5.0	59	44
Land Class II						
Neutral Hills	10.8	15.5	144	6.3	58	41
Sullivan Lake	10.3	13.5	131	6.2	60	46
Sounding Creek	12.4	16.8	135	6.8	55	40
Berry Creek	10.2	15.0	147	5.6	55	37
Tilley East	9.7	14.4	148	6.5	67	45
Bow West	10.7	14.7	137	6.4	60	44
Land Class III						
Neutral Hills	13.0	17.3	133	8.5	65	49
Sullivan Lake	12.0	16.3	136	7.3	61	45
Sounding Creek	15.7	17.4	111	10.7	68	61
Berry Creek	11.3	16.3	144	6.6	58	40
Tilley East	13.4	16.2	121	9.8	73	60
Bow West	12.6	17.5	139	8.6	68	49

(1) The number of records for farms consisting predominantly of Class IV parcels is too small to provide significant data.

(2) Sounding Creek, 1922–35, 1922–28, 1929–35.

(3) Including 6 townships in Rosenheim.

(4) Including Acadia Valley.

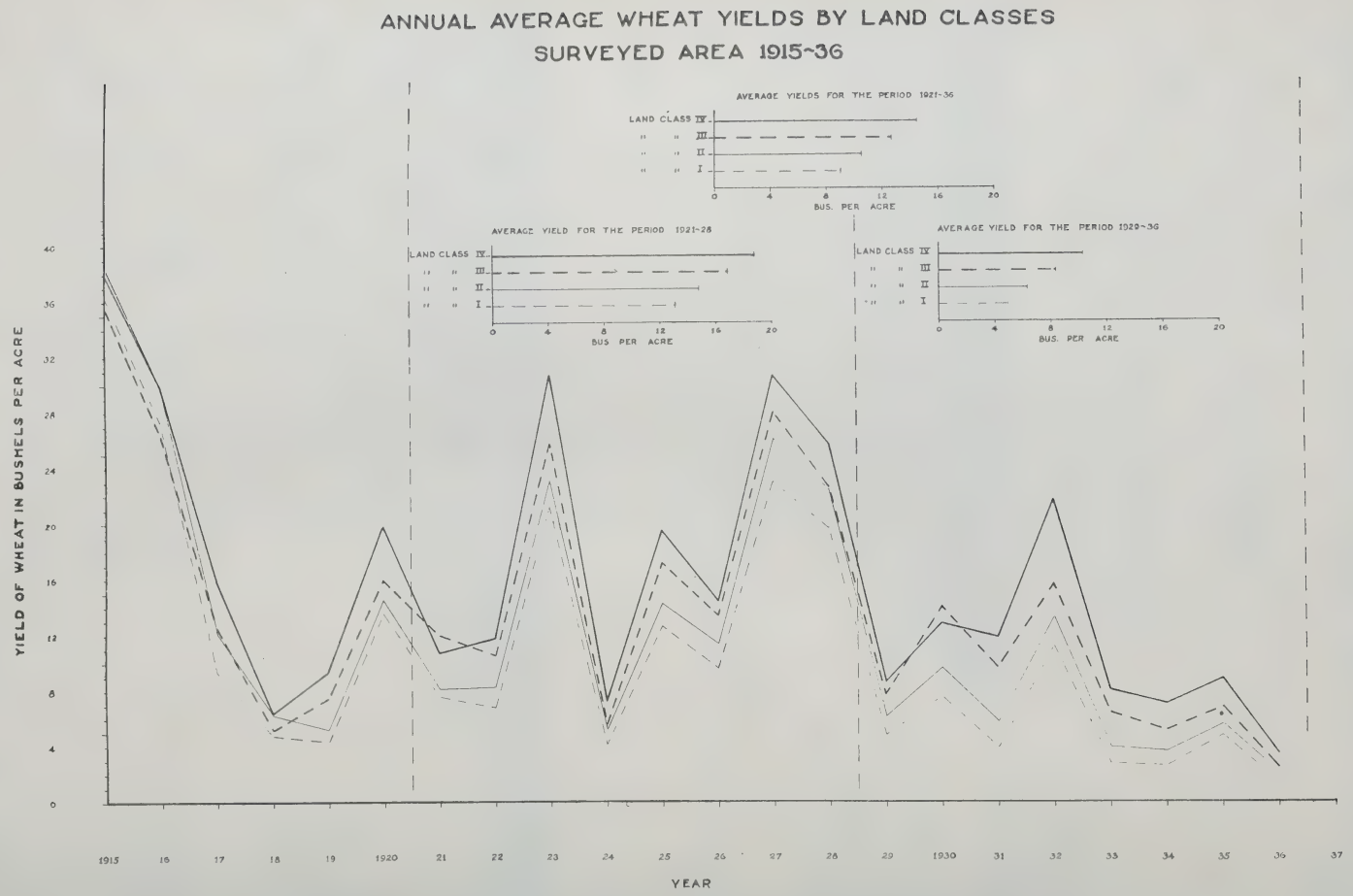

CHART 3. Annual Average Wheat Yields 1915-1936 by Land Classes.

The period 1921-36, which has been used to determine the long-run average yield, covered a period of relatively favourable physical conditions and high yields, namely 1921-28, and another period of relatively unfavourable physical conditions and low yields, namely 1929-36. The average yields for these shorter periods by land classes, and areas, are shown in table 9.

The absolute differences between the average yields for the long period and each of the short periods appear to be approximately the same for all land classes. Thus the yields for the period 1921-28 are, in general, from 4 to 5 bushels more than the long-run averages, whereas the yields for the period 1929-36 are less than the 1921-36 averages by roughly the same amount.

It follows from this that the relative variation in yields between the periods is less for the higher land classes than for the lower land classes. Thus for Class I the 1921-28 averages are roughly 40 to 50 per cent greater than the long-run averages; the 1929-36 averages are less than the long-run averages by approximately the same proportions. On the other hand, for Class III the relative differences between the period and long-run averages are of the order of 30 to 35 per cent.

The conclusion to be drawn from this comparison of yields for short periods namely that producers on land in the higher classes are likely to experience smaller relative fluctuations in yields, supports the conclusion suggested by the measurement of the variability of annual yields.

This analysis of wheat yields by land classes establishes three important features of the land classes.

(1) Producers located on the higher classes of land may expect to secure significantly higher long-run average yields.

(2) Annual fluctuations in yields, measured in bushels, tend to be somewhat greater in the higher land classes.

(3) Fluctuations in yields, expressed as proportions of the long-run average, are smaller in the higher than in the lower land classes. On the whole, it would seem that, in relation to the producers' problems, this method of measuring variations is more significant than the measure of variations in terms of bushels.

Farm Buildings.—During the surveys the location of farm buildings was recorded, and it was determined whether or not these were occupied at the time. In addition the buildings, both occupied and abandoned, were graded on condition. Although changes have occurred since the surveys were made the record of occupied farmsteads provides an indication of the present density of settlement. The existence of unoccupied buildings is evidence, although incomplete evidence, of the extent of abandonment and population movement. The statistical data are given in table 10. The Map of Location of Resident Farmers (Fig. 4) shows the location of occupied farmsteads at the time of the various surveys. The Map of Farm Buildings (Fig. 6) gives the location of all buildings, occupied and unoccupied, and is coded to indicate the condition of the buildings. The location of resident farmers was recorded in Sounding Creek and Acadia Valley during the survey of 1936. The record was revised when this territory was re-classified in 1939. The re-survey revealed some appreciable shifts in occupancy. These shifts, occurring over the three-year period, are indicated in Fig. 5.

Density of Settlement.—Owing to the movement of farm families which may have occurred since the surveys were completed, conclusions regarding

the number of resident families in the surveyed area must be qualified ones. However, the generally sparse nature of settlement is clear. The records show 4,421 occupied farmsteads in an area of 51,093 parcels (table 10). This represents, on the average, close to one family to every 12 parcels, or three square miles. At the same time it can be seen from Figure 4 that the density of settlement varies appreciably between Areas, and between localities within the same Area. The number of parcels per occupied farmstead ranges from 6.4 in Rosenheim to 21.6 in Berry Creek. Tilley East and Sounding Creek are also relatively sparsely settled. Over the whole territory there are few townships with more than 36 occupied farmsteads, that is, one farm family to every square mile.

Areas of relatively close settlement, which can be observed in Figure 4, are found in the following locations:

(1) The Hand Hills district, west of Hanna in Sullivan Lake Area. This is the district of greatest density of settlement. In 1937 there were 87 resident farmers in Twps. 29 and 30; Rge. 16. Proceeding east from here the density of settlement decreased steadily. Twps. 29-33; Rge. 15, averaged 35 occupied farmsteads; the same townships in Rge. 14 averaged only 24 farmsteads.

(2) The Hilda district, Tilley East Area. In this district a block of 8 townships (Twps. 15-18, Rges. 1 and 2) averaged 32 families in 1938.

(3) Rosenheim Municipality. Twp. 37; Rges. 1 and 2 contained 61 occupied farmsteads in 1937.

(4) Around Consort, Neutral Hills Area. Four townships (Twp. 35; Rges. 5-7, and Twp. 34, Rge. 6) averaged 30 families in 1937.

(5) North-west corner, Neutral Hills Area. Six townships (Twps. 35-37; Rges. 8 and 9) averaged 29 families.

(6) Twp. 28; Rge. 1, in the Sounding Creek Area contained 26 occupied farmsteads in 1939.

(7) Acadia Valley Municipality. Two townships (Twps. 24 and 25; Rge. 2) contained 53 farmsteads in 1939.

(8) In the Bow West Area (1939) there was only one township (Twp. 13; Rge. 19) with more than 30 families.

It would be reasonable to expect some relation between density of settlement and the productivity of land. In areas largely submarginal for wheat production it might be expected that ranching activities would predominate, the farm or ranch units be large, and settlement sparse. In the areas of more productive land, greater emphasis on wheat growing, more intensive use of land, and smaller farm units might be expected. These conditions would be associated with closer settlement. However, a close relation between density and productivity would reflect the absence of any serious conditions of maladjustment. In any problem area there will be regions of relatively poor land which remain too heavily populated, and even in more productive regions the size of farm unit may be smaller, and settlement more dense, than is consistent with the productivity of the land. In some situations abandonment might have proceeded to the point where the farm population is reduced below the carrying capacity of the land. For these reasons no close relation between density and land class based on productivity need be expected in the surveyed area.

Reference to Figure 4 does indicate that the areas of relatively dense settlement referred to above are also areas of concentration of higher land classes. In the Sullivan Lake Area the tendency to decreasing density of settlement,

proceeding east from the west boundary, is associated with a change from Land Classes III and IV to submarginal land. The heavily populated townships in the Hilda district consist mainly of Class III parcels. This is an area of relatively small farms, populated largely by families of German origin. The character of the settlement is clearly influenced by the origin and habits of the people. Rosenheim municipality contains a relatively large proportion of Land Classes III and IV. In Neutral Hills the region around Consort is mainly Class III. The other region of relatively dense settlement in this Area is less uniform but includes a substantial proportion of Class III parcels. The more productive lands in Acadia Valley are fairly closely settled; and in Bow West the townships consisting mainly of Land Classes III and IV are also the townships with the largest numbers of resident farm families. Township 11; Rge. 18 is a notable exception. The situation here is affected by the existence of unusually large farm units.

When the occupied buildings are grouped on the basis of the land class of the parcel on which they are situated, it appears that slightly less than one-half were located on Class I parcels (table 10). This may, however, be somewhat misleading. The land class on which the farm buildings are located is not, in all cases, indicative of the productivity of the land in the farm unit. In many cases the farm buildings are located on parcels which are relatively poor for wheat production. Some of these are rough parcels close to rivers or coulees which provide facilities for stock-watering. In other instances the buildings are located on submarginal parcels because of the advantage of having pasture close to the farmstead. This point may require to be emphasized because it would be a mistake to assume that, even if land in submarginal parcels were to be retired from cultivation, it would be necessary to move all those families on Class I parcels.

TABLE 10.—FARM BUILDINGS BY LAND CLASSES AND CONDITION

Land Class	Occupied Buildings				Unoccupied Buildings			Total Bldgs.
	Good	Fair	Poor	Total	Usable	Useless	Total	
I	17	164	1,915	2,096	548	1,582	2,130	4,226
II	9	222	1,367	1,598	276	481	757	2,355
III	11	148	454	613	104	138	242	855
IV	4	35	75	114	15	16	31	145
Total	41	569	3,811	4,421	943	2,217	3,160	7,581

In general, the occupied buildings in the surveyed area are poor in comparison with farm buildings in other parts of the province. This is due, in part, to the nature of the farming and the relatively small attention given to live stock. Other reasons are the less permanent nature of settlement, and the deterioration which has occurred in recent years. The proportion of good and fair occupied buildings is appreciably higher in Land Classes III and IV, than in the classes of less productive land (table 10).

Abandoned Buildings.—As already noted, the number of unoccupied buildings is an indication, but an incomplete indication, of abandonment. There are, throughout the Areas, many locations which show evidence of having, at some time, been the site of farm buildings. The buildings are now gone. The abandonment of existing unoccupied buildings has not all occurred in recent years. It may perhaps be assumed that the usable unoccupied buildings have, in most cases, been recently abandoned; but so also have many useless buildings. In view of the terms used to describe the condition of abandoned buildings, it should be noted that recorded unoccupied buildings do not necessarily consist

of complete farmsteads. In many cases only one building remains. This may be either a dwelling house or barn. In this territory buildings are frequently moved, and the present location of buildings may be somewhat different from that recorded at the time of the surveys. The map (Fig. 6) shows that abandonment of farm homes has been extensive. Three thousand, one hundred and sixty buildings, or 42 per cent of all buildings found in the area, were unoccupied (table 10). The proportion of unoccupied buildings is less in the higher than in the lower land classes. Half of the buildings on Class I parcels, and only 21 per cent of those on Class IV parcels, were unoccupied.

Less than 30 per cent of the abandoned buildings were rated as usable. There were 943 such buildings, and of these 548, or 58 per cent were on Class I parcels. The proportion of usable unoccupied buildings is greater in the higher land classes. There were 119 usable unoccupied farmsteads in Class III and IV parcels. The precise location of usable unoccupied buildings, at the time of the surveys, is shown in the map (Fig. 6).

Land Use.—Information on land use was secured from field inspection, farm records, and aerial photographs. The data used in the preparation of the Cultivation Pattern Map (Fig. 7) and presented in table 11 were derived from aerial photographs, and checked against information from other sources. Any method would involve a margin of error, but the data presented may be assumed to provide a reasonably reliable record of land use in the surveyed area.

Recent cultivation is land which appeared to have been cultivated during the three or four years immediately preceding the year of the survey. *Abandoned or idle land* is land which has been broken but which was not apparently cultivated during the preceding three or four years. The distinction between these two categories cannot always be made with assurance. The two categories merge into one another. Some of the abandoned or idle land will be similar in condition to some of the recently cultivated land; other idle land, while showing evidence of earlier cultivation may have been idle so long as to be almost completely restored to sod. This means that the condition of the pasture cover on idle land will vary appreciably. *Pasture land* is land which, so far as could be observed, has never been broken. This condition does not imply the existence of good grass cover. Much poor grass land has never been ploughed; and even in the case of relatively productive pasture land, successive dry years and continued grazing have in many cases practically denuded the land of grass cover. Such parcels are commonly heavily infested with weeds. *Waste* includes all land unfit for use either because of topography or the presence of water. It also includes small fractions of quarters, for example, along and in rivers; highways; railroads; and town and school sites.

The surveyed area exceeds 8 million acres, although the deduction of waste reduces the land area to slightly below this figure (table 11). Less than two-thirds of the land area, excluding waste, is unbroken prairie, the remainder having at some time been broken. Of the broken land, 1,733,154 acres (roughly 60 per cent) have been recorded as recently cultivated, and 1,218,616 acres as abandoned or idle broken land. Expressing the cultivation figures in another way, it appears that while 38 per cent of the area has been broken at some time, less than one-quarter has been cultivated in recent years, and, as indicated later in this report, a substantial proportion of this is in unoccupied parcels and therefore probably not in use now.

The Cultivation Pattern Map (Fig. 7) indicates that the principal area of unbroken prairie is in Tilley East. Apparently, more than three-quarters of the land in this Area has never been broken. In the Berry Creek Area, the second of the Special Areas to be formed, a high proportion of abandoned culti-

vation reflects the process of adjustment in this Area which has been part of the administrative policy. The principal concentrations of recent cultivation are found in the Neutral Hills and Bow West Areas, and in Rosenheim and Acadia Valley municipalities. Other mainly-cultivated areas are found west of Hanna, in Sullivan Lake, and in the east side of Tilley East.

Some correspondence between land use and land class based on productivity would be expected. On the other hand, the recognition of the existence of a problem area implies that land use is not satisfactorily adjusted to the productivity of the land. Although in the past, the use of land has been determined without the knowledge of its productive capacity which is now available, it would be incorrect to suppose that either the officers of the crown, who had some responsibility for the initial disposal of public land, or the individual settlers who filed on particular parcels were totally incapable of distinguishing between relatively productive and relatively unproductive land. The facts disprove this. Certain lands, and these in the main consist of Class I parcels, have been retained as crown lands and leased for grazing purposes. Further,

TABLE 11.—LAND USE BY LAND CLASSES. SURVEYED AREA

Land Class	Broken			Pasture	Total Broken and Pasture	Waste	Total Land Area[1]
	Recently Cultivated	Idle	Total				
	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.
I.....	640,240	1,067,126	1,707,366	4,537,644	6,245,010	194,883	6,439,893
II.....	724,673	129,779	854,452	291,436	1,145,888	9,940	1,155,828
III.....	311,307	20,820	332,127	66,853	398,980	2,956	401,936
IV.....	96,934	891	97,825	7,850	105,675	245	105,920
All Land Classes	1,773,154	1,218,616	2,991,770	4,903,783	7,895,553	208,024	8,103,577

[1] Exclusive of land in statutory road allowances.

in the case of alienated parcels, the proportion of broken land is larger in the higher land classes. Over 70 per cent of the land in Class I parcels is unbroken prairie. The proportion falls sharply between Land Class I and Land Class II. In the latter class roughly 25 per cent of the land, other than waste, is prairie. The proportion of prairie land is still lower in Land Class III, and less than 8 per cent of the land in Class IV parcels has not at some time been cultivated.

Again, it would be expected that, over the period of settlement and development, experience would add to the discrimination of settlers, and those who had acquired and improved infertile land would, in many cases, abandon the land or permit it to revert to grass. In this event the proportion of idle broken land would be greater in the less productive parcels, particularly in Class I parcels. This is clearly indicated in the data. In Class I parcels, 63 per cent of the broken land is recorded as idle. At the other extreme, more than 99 per cent of the broken land in Class IV has been recently cultivated.

There is, however, evidence that still further adjustment may be required. The process of retirement of land from cultivation, even when experience indicates that cultivation cannot be profitably pursued, does not take place without difficulty. Individuals who have established themselves on poor land do not readily leave the farms in which they have invested much time, effort and resources; and the change is impeded in times when alternative opportunities are limited. These circumstances, in addition to the persistent hope of the recurrence of more favourable conditions, would serve to explain the large part of the remaining 640,240 acres of recently cultivated land in Class I parcels.

Further, a part of the apparent discrepancy between land use and land class is associated with matters of farm organization. Many parcels may be placed in Class I because only a small portion of the parcel can be considered as tillable. But this small acreage may consist of relatively productive soil. In any farm unit it may be profitable to cultivate this land while using the remaining acreage for pasture. On similar grounds it would be unreasonable to expect that all of the land in the higher land classes should be cultivated. Some acreage in a block of productive tillable land will be used for grazing. The proportion of this might be expected to be greater in marginal areas, where the farm unit is likely to be organized on the basis of mixed wheat production and grazing. This is borne out by the data. Finally, some relatively productive land has never been homesteaded, being retained by the crown and leased for grazing. The amount of this is, however, small.

It may be of interest to enquire more fully into the extent of the change in land use which would be effected if all recently cultivated land in Class I parcels were retired from cultivation. The comments above indicate that the classification does not imply that all such land should not be cultivated. As already indicated 640,240 acres in Class I parcels are recorded as recently cultivated. Some of this land is in parcels which have already been abandoned, and therefore not all of it is in active use for crops at the present time. Overlooking this, the acreage of cultivated land in Class I parcels represents about 8 per cent of the total land area, and 36 per cent of all cultivated land in the surveyed area. The extent of the adjustment required would vary appreciably between localities. Comparing the different administrative units the proportion of the total land area recorded as recently cultivated land in Class I parcels ranges from 6 per cent in Sullivan Lake to 15 per cent in Sounding Creek. The proportion of recently cultivated land in Class I parcels to total recently cultivated land ranges from around 20 per cent in Bow West, Rosenheim and Acadia Valley to about 70 per cent in Berry Creek.

Unoccupied Land.—The recording of occupied farm units, in all areas except Bow West, provided an indication of the extent of unoccupied land at the time the various surveys were made. Unoccupied land is land which is unused or is being used by persons who have no legal claim to the use of the land. Throughout the surveys some parcels were found to be occupied, and used, by squatters; in other cases, in fact generally, unoccupied parcels were being used for grazing. Such parcels were recorded as unoccupied. Owing to the method of obtaining the information, it is probable, particularly in locations close to the margins of Areas, that some parcels recorded as unoccupied may actually have been included in farm units operated from outside the Areas. In table 12 the number of unoccupied parcels by land classes and ownership is indicated; the condition of the unoccupied land is shown in table 13. Significant changes have no doubt occurred since the various Areas were surveyed.

TABLE 12.—UNOCCUPIED PARCELS BY LAND CLASSES AND OWNERSHIP. SURVEYED AREA EXCLUDING BOW WEST

Land Class	Ownership				Total Unoccupied Parcels	Total Occupied and Unoccupied Parcels
	Private Owner Resident in the Area	Private Owner Resident outside the Area	Company and Agency	Crown and Municipality		
	No.	No.	No.	No.	No.	No.
I	1,647	1,983	2,288	10,043	15,961	37,511
II	275	179	185	116	755	5,910
III	102	51	40	29	222	2,072
IV	11	2	3	—	16	314
All Land Classes	2,035	2,215	2,516	10,188	16,954	45,807

Within the territory for which this information was secured 16,954 parcels or 2,682,239 acres, were unoccupied. This represents 37 per cent of all parcels and 36 per cent of the total land area, excluding waste. The proportion of unoccupied parcels exceeded 40 per cent in the Sounding Creek and Sullivan Lake Areas. In Acadia Valley only 23 per cent of all parcels were unoccupied. It is probable that all of the land in these Areas has, at some time, been included in occupied farms or ranches. The area of unoccupied land is therefore an indication of the extent of abandonment; although some of this abandoned land may not have been in use, except as a source of free grazing, for many years.

Ninety-four per cent of the unoccupied land was in Class I parcels, and 43 per cent of all Class I parcels were unoccupied. Only 13 per cent of Class II parcels, 11 per cent of Class III parcels, and 5 per cent of Class IV parcels were recorded as unoccupied.

Roughly one quarter of the unoccupied land, excluding waste, had been broken; and about 75 per cent of the broken land had been idle for some years. Only 18 per cent of the broken land in unoccupied Class I parcels was recently cultivated; on the other hand all of the broken land in unoccupied Class IV parcels was recently cultivated. It is likely that most of these Class IV parcels were in fact included in occupied farms operated from outside the Areas.

Sixty per cent of all unoccupied parcels were crown or municipal parcels; only 12 per cent were owned by persons resident in the Areas. Crown and municipal parcels represented 63 per cent of all unoccupied Class I parcels; in contrast 85 per cent of the unoccupied Class II parcels, 87 per cent of Class III parcels, and all of the Class IV parcels were privately owned.

TABLE 13.—UNOCCUPIED LAND BY LAND CLASSES AND CONDITION. SURVEYED AREA EXCLUDING BOW WEST

Land Class	Broken Land			Pasture	Total Broken & Pasture	Waste	Total Land Area
	Recently Cultivated	Idle	Total				
	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.
I....	105,498	481,274	586,772	1,831,474	2,418,246	105,444	2,523,690
II....	52,627	33,982	86,609	32,926	119,535	998	120,533
III....	20,211	6,192	26,403	8,627	35,030	424	35,454
IV....	2,296	——	2,296	239	2,535	27	2,562
All Land Classes	180,632	521,448	702,080	1,873,266	2,575,346	106,893	2,682,239

In general, there was a high proportion of unoccupied land in the Areas, principally in Class I parcels, but the proportion of recently cultivated land in unoccupied parcels was relatively low. Most of the less productive parcels were publicly owned; most of the more productive parcels were privately owned.

Ownership and Tenure of Land.—Information on ownership of land was secured from municipal roll books and records of the Special Areas Board, at the times the different Areas were surveyed. Information on tenure of land was obtained from the enumeration of parcels in farm units. In this section attention is directed to two tenure conditions; first, public ownership, i. e., publicly owned land which may be rented, leased, or unused; second, private ownership and operation, land in this category being used by the owner.

Public Ownership of Land.—Publicly owned land includes all municipal land in the organized municipal units; and also crown land in the Special Areas,

under the control of the Special Areas Board, Department of Lands and Mines, Province of Alberta. Some public land has never been alienated; but many alienated parcels have reverted from private to public ownership. The policy of the Special Areas Board has been to induce reversion to public ownership, and a substantial increase in the amount of public land has occurred in recent years. As a result the accuracy of the survey records, as an indication of present ownership, varies with the time at which the surveys were made. With a view to providing a more up-to-date record of public ownership, and to indicate the degree to which this condition has been extended, a record of publicly owned parcels was obtained from the Special Areas Board, at March, 1940. The survey information on the extent and condition of publicly owned land is presented in table 14; the condition at March, 1940, is shown in the Ownership Map (figure 8) and table 15. An indication of the increase in public ownership can be obtained from table 16.

In general, the surveyed area contains a relatively high proportion of public land. This can be attributed to a number of factors including the character of the land, the unfavourable conditions of the past decade, and the administrative policy regarding these problem Areas. On the basis of the survey information slightly less than one-half of the total land area (excluding waste) was public land. The proportion varied considerably between Areas, being as high as over 70 per cent in Berry Creek and Tilley East, both of which were established some years ago. Even before the formation of the large units, a relatively high proportion of the land in these two Areas was retained by the crown and leased for grazing. In the remaining Areas, at the time they were surveyed, the proportion of public land was between 25 per cent and 35 per cent.

TABLE 14.—PUBLIC LAND BY LAND CLASSES [1]

Land Class	Broken			Pasture	Total Broken & Pasture	Waste	Total Land Area
	Recently Cultivated	Idle	Total				
	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.
I....	95,121	477,584	572,705	3,018,481	3,591,186	126,696	3,717,882
II....	35,406	18,309	53,715	54,836	108,551	1,000	109,551
III....	11,231	2,108	13,339	11,130	24,469	166	24,635
IV....	2,320	——	2,320	860	3,180	20	3,200
Surveyed Area ...	144,078	498,001	642,079	3,085,307	3,727,386	127,882	3,855,268

[1] Comparable data for all land can be found in table 11, p. 53.

As disclosed by the surveys, the publicly owned parcels contained relatively little recently cultivated land, indicating that these parcels were being used mainly for grazing. For the entire area surveyed, 8 per cent of the recently cultivated land was publicly owned; excluding Berry Creek (35%) and Tilley East (12.5%), the highest proportion was 6 per cent in Neutral Hills. About 40 per cent of the idle broken land was in public parcels, but the proportions varied considerably between Areas, ranging from 6 per cent in Rosenheim to 80 per cent in Berry Creek. In all Areas, the proportion of public land was highest in Land Class I. Little Class IV land was publicly owned. Fifty-seven per cent of the total land area, excluding waste, included within Class I parcels was publicly owned; less than 10 per cent in the more productive classes. In Class I parcels, 15 per cent of the recently cultivated land was publicly owned; less than 5 per cent in the other land classes. Again 45 per cent of the idle broken land in Class I was in public parcels; less than 15 per cent in each of the

other classes. While the proportions varied in different Areas, the same relations between ownership, land class and land use were generally apparent in all Areas.

TABLE 15.—PUBLICLY OWNED PARCELS,[1] AT MARCH 1940, BY AREAS AND LAND CLASSES

Area	Land Class				
	I	II	III	IV	All Land Classes
	Parcels	Parcels	Parcels	Parcels	Parcels
Neutral Hills	2,373	177	64	2	2,616
Sullivan Lake	2,195	110	19	2	2,326
Sounding Creek	4,240	362	9	—	4,611
Berry Creek	6,170	148	35	—	6,353
Tilley East	9,844	199	34	—	10,077
Bow West	1,345	180	34	7	1,566
Special Areas	26,167	1,176	195	11	27,549
Rosenheim	189	3	5	—	197
Acadia Valley	505	45	25	7	582
Surveyed Area	26,861	1,224	225	18	28,328

[1] Comparable data for all parcels will be found in table 1, p. 36.

The information regarding ownership at March 1940 indicates that, at that time, 55.4 per cent of all parcels in the surveyed area were publicly owned. Two-thirds of the Class I parcels were publicly owned; 17 per cent of Class II; 9 per cent of Class III; and less than 3 per cent of Class IV.

Table 16 indicates that substantial increases in public ownership had occurred in the Sounding Creek, Neutral Hills, and Sullivan Lake Areas. In the older Areas—Berry Creek and Tilley East—and in the most recently constituted area—Bow West—the tendency was less pronounced. Of the two areas not included in the Special Areas at March 1940, Rosenheim showed some decrease in public ownership, while there was a slight increase in Acadia Valley.

The material presented in this section shows that there is, in the surveyed area, a relatively high proportion of publicly owned land, the proportion having increased appreciably in recent years. Most of the land in public parcels is unbroken, and the large part of the broken land has been idle for some time. A high proportion of the public land is in Class I parcels.

Privately Owned and Operated Land.—This category includes all land which is farmed by the owner. In most cases the owner is an individual. It does not include parcels owned by individuals and companies when these are rented or leased to others. Information on this condition was obtained from field records of occupied farm holdings, and may be taken as fairly complete and accurate, as at the time of the surveys. Some change in the direction of a reduction of privately owned and operated land has occurred since the surveys were completed. No information on land tenure, other than ownership, was secured in Bow West, and consequently the analysis here does not cover that Area. The data on privately owned and operated land are given in table 17.

TABLE 16.—PUBLICLY OWNED PARCELS AS PER CENT OF ALL PARCELS

Area	Survey Year	Land Class									
		I		II		III		IV		All Land Classes	
		Survey Year	March 1940	Survey Year	March 1940	Survey Year	March 1940	Survey Year	March 1940	Survey Year	March 1940
		%	%	%	%	%	%	%	%	%	%
Neutral Hills	1937	39.0	52.3	6.8	14.6	5.4	9.1	7.4	7.4	29.2	40.4
Sullivan Lake	1937	35.5	55.3	5.3	11.7	3.6	5.3	0.0	8.0	27.8	44.0
Sounding Creek	1936	36.3	56.3	6.4	20.7	3.5	10.5	0.0	0.0	30.4	49.1
Berry Creek	1938	80.1	81.9	17.5	39.8	35.6	38.9	0.0	0.0	76.6	79.4
Tilley East	1938	77.4	79.0	14.3	16.6	5.6	7.6	— —	——	69.8	71.4
Bow West	1939	38.6	42.3	9.8	13.6	4.8	7.7	2.0	2.0	26.2	29.6
Special Areas		58.2	66.7	9.0	17.3	6.2	9.2	2.1	2.6	48.5	56.7
Rosenheim	1937	38.7	36.2	4.1	2.5	4.4	3.7	2.3	0.0	24.9	22.8
Acadia Valley	1936	45.0	53.6	6.3	14.2	5.1	9.8	5.2	4.5	27.8	34.8
Surveyed Area		**57.6**	**66.0**	**8.8**	**16.9**	**6.0**	**8.9**	**2.9**	**2.7**	**47.5**	**55.4**

Although this category does not include all land which is not publicly owned, the general condition is the reverse of that described for public lands. On the basis of the survey information, approximately one-quarter of the total land area, excluding waste, was privately owned and operated, the proportion being lowest in Berry Creek (11%) and Tilley East (16%), and highest in Acadia Valley (47%).

TABLE 17.—PRIVATELY OWNED AND OPERATED LAND,[1] BY LAND CLASSES. SURVEYED AREA EXCLUDING BOW WEST

Land Class	Broken Land			Pasture	Total Broken & Pasture	Waste	Total Land Area
	Recently Cultivated	Idle	Total				
	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.	Ac.
I	295,162	156,800	451,962	480,232	932,194	24,417	956,611
II	383,748	40,271	424,019	114,541	538,560	5,012	543,572
III	165,993	6,950	172,943	26,956	199,899	1,558	201,457
IV	33,904	565	34,469	2,507	36,976	127	37,103
Surveyed Area (Ex. Bow West)	878,807	204,586	1,083,393	624,236	1,707,629	31,114	1,738,743

[1] Comparable data for all land in the surveyed area, excluding Bow West, are:

Recently Cultivated	1,472,348
Idle	1,116,995
Total Broken	2,589,343
Pasture	4,485,193
Total Broken and Pasture	7,074,536
Waste	199,733
Total Land Area	7,274,269

Over the whole territory, excluding Bow West, the proportion of recently cultivated land which was in privately owned and farmed parcels was 60 per cent; the figure for individual Areas ranging from 41 per cent in Berry Creek to 74 per cent in Acadia Valley. Eighteen per cent of all idle broken land was in private parcels; the proportion varying from 11 per cent in Berry Creek to 45 per cent in Acadia Valley.

In general the proportion of privately owned and operated land is low in Class I and high in Class IV. For the area for which information is available, total land area, excluding waste, in this category increased from 16 per cent (Class I) to 74 per cent (Class IV). In Class I, 51 per cent of the recently cultivated land was privately owned, and in Class IV, 76 per cent.

The material in this section indicates that the proportion of privately owned and operated land is substantially smaller than the proportion of publicly owned land. Most of the privately owned land is broken, and the large part of the broken land has been recently cultivated. In comparison with other land classes, privately owned and operated land constitutes a small proportion of the total land in Class I.

ASSESSED VALUES.—The assessed acreage and assessed value of parcels were taken from the municipal roll books. The values obtained were those for the equalization period 1935-37, and are therefore comparable as between administrative units. The entire surveyed area has been reassessed since that time, the new assessment going into effect in 1940. No values were available for crown or municipal lands. The assessed values of parcels are shown in the Assessment Map (Figure 9). The values in table 18 were obtained by dividing the total assessed values for all parcels, in given land classes and areas, by the total assessed acres.

The total assessed area was 4,189,049 acres, and the total assessed value $23,387,487, or $5.58 per acre. This is equivalent to an assessed value of roughly $900 for a parcel of 160 assessable acres. The large proportion of the parcels were assessed at between $300 and $1,500. In certain sections, indicated on the map, assessed values exceeded $1,500, with some parcels valued at more than $2,000. These relatively high values occurred mainly in Neutral Hills and Rosenheim, the western portions of Sullivan Lake, and in Bow West. Values in Berry Creek and Tilley East were generally low.

The table and map both indicate a broad relation between assessed value and land class. In checking the land class of adjacent quarters attention was given to the assessed values. However, the number of cases in which this led to adjustment of the land class was small. The assessed value and land class may therefore be considered as independently determined. The existence of a broad relation between the two lends some general support to the classification.

However, discrepancies between assessed values and land class occur, and these are clearly of interest. At the same time the 'correct' relation between assessed value and land class is not easy to define. If net productivity were taken as an indication of ability to pay taxes, the equalization of the tax burden might be attained, with a uniform mill rate, when parcels with the same net productivity were assessed equally. But it is difficult to determine how much of the net product might, or should, be drawn off in taxes. Such withdrawal would tend to reduce the market value of property, and, in the case of privately owned land, to reduce the owner's equity. The amount which could be taken, without reducing the farmer's returns below the amount required to induce continued production, would range between zero and the full amount of the net revenue. This is too wide a range to provide any necessary relation between net productivity and assessed value. In terms of land classes this is equivalent to saying that it is not possible to define a required relation between assessed value and land class. However, if the land classes reflect net productivity accurately, equalization of assessment might be broadly provided where the values of the same land class, and the relation between assessed values and land classes, were approximately the same in different administrative units. If this were not so then, either equalization of assessment has not been attained, or the land classification is defective.

The average assessed value for Land Class II varies from $3.69 per acre in Tilley East to $8.22 in Neutral Hills. Assuming that the classification is reasonably accurate, so wide a discrepancy suggests that relatively unproductive lands are either under-assessed in Tilley East, or over-assessed in Neutral Hills. Comparing the assessed values of Class II parcels with those of Class III parcels, the rate of increase is significantly different in different areas. For example, in Tilley East and Berry Creek assessed values of Class III parcels are, on the average, roughly 50 per cent greater than those for Class II parcels; while in Neutral Hills, Sullivan Lake and Sounding Creek, the difference is less than 20 per cent. Again, assuming that the classification is reasonably accurate, this suggests that more productive parcels are either relatively over-assessed in Tilley East and Berry Creek, or relatively under-assessed in Neutral Hills, Sullivan Lake, and Sounding Creek.

TABLE 18.—ASSESSED VALUE PER ACRE FOR THE EQUALIZATION PERIOD 1935–37, BY LAND CLASSES AND AREAS

Areas	Land Class				All Land Classes
	I	II	III	IV	
	Value per Acre	Value per Acre	Value per Acre	Value per Acre	Value per Acre
	$	$	$	$	$
Neutral Hills	6.22	8.22	9.62	9.32	7.23
Sullivan Lake	5.86	7.87	9.02	9.89	6.65
Sounding Creek	5.21	6.32	7.51	8.13	5.53
Berry Creek	2.94	3.99	5.85	10.05	3.20
Tilley East	2.68	3.69	5.51	——	3.23
Bow West	4.70	6.46	8.38	10.72	6.20
Special Areas	4.80	6.39	8.18	10.48	5.57
Rosenheim	4.63	7.88	10.15	12.82	7.41
Acadia Valley	3.81	5.21	6.12	6.19	4.91
Surveyed Area	4.76	6.37	8.08	9.81	5.58

PRICES PAID FOR LAND.—During the surveys information was obtained from farmers on the prices they had paid for particular parcels. Such information could, of course, be secured in this way only for privately owned and operated land. For purposes of analysis all homesteads, pre-emptions and parcels acquired by tax sale were excluded. Information on acquisition of land was not taken in the Bow West Area.

TABLE 19.—AVERAGE PRICES PAID FOR LAND, BY AREAS AND LAND CLASSES. SURVEYED AREA EXCLUDING BOW WEST

Areas	Total Acreage	Land Classes			
		I	II	III	IV
		Av. Price per Acre	Av. Price per Acre	Av. Price per Acre	Av. Price Per Acre
		$	$	$	$
Neutral Hills	151,515	8.52	13.17	17.15	23.64
Sullivan Lake	140,644	9.69	13.78	16.85	20.55
Sounding Creek	179,612	9.37	11.81	20.26	17.54
Berry Creek	38,847	6.75	10.20	12.66	22.50
Tilley East	151,221	6.33	9.51	14.78	——
Bow West	——	——	——	——	——
Special Areas (Ex. Bow West)	661,839	8.33	11.94	16.59	20.85
Rosenheim	33,041	8.72	14.23	16.42	20.30
Acadia Valley	63,296	5.05	8.28	9.00	7.93
Surveyed Area (Ex. Bow West)	758,176	8.20	11.73	15.40	14.94

The records of purchases cover 758,176 acres or 4,747 parcels (table 19). These transactions occurred during periods of high and of low prices, and included purchases of both improved and unimproved parcels. The average price paid for all parcels was $10.78 per acre.

The factors affecting prices paid for land are complex. Even where buyers and sellers were well-informed regarding the productivity of the land, and valued the land on the basis of reasonable expectation of prices of commodities and services, it is unlikely that all land of a given level of net productivity (as defined in this study) would sell for the same price. But, under these conditions, it might be expected that generally higher prices would be paid for more productive land. Purchasers of land in the area surveyed have not always been well-informed regarding the land they bought, and their expectations of produce prices have frequently been ill-founded. However, the data in table 19 indicate a broad relation between land class and average prices paid, and reflect a significant measure of discrimination.

TABLE 20.—AVERAGE PRICES PAID FOR LAND BY PERIODS AND LAND CLASSES, NEUTRAL HILLS SPECIAL AREA INCLUDING ROSENHEIM

Period	Land Class							
	I		II		III		IV	
	Parcels	Price per Acre	Parcels	Price per Acre	Parcels	Price per Acre	Parcels	Price per Acre
		$		$		$		$
1910–14	12	9.04	16	9.46	14	12.62	6	14.80
1915–19	76	12.89	69	15.89	80	16.50	25	19.12
1920–24	90	9.85	50	13.32	53	22.22	14	22.40
1925–29	207	7.51	163	13.21	123	16.18	14	25.30
1930–34	52	6.74	26	11.94	19	13.89	—	——

Moreover there is evidence that, with the passage of time and increased knowledge of the physical productivity of lands in the area, market prices have more closely reflected relative productivity. Using data for 1,109 transactions in the Neutral Hills Area it is evident that in later years the spread between prices paid for Class I parcels and parcels in the higher land classes has been greater than in earlier years. Even allowing for the fact that parcels in the higher land classes are more highly improved than parcels in Class I, the trend in prices does reflect increasingly accurate appraisal of the basic productivity of land (table 20).

Tax Arrears.—Information on tax delinquency was taken from the municipal roll books. The information indicated the amount of arrears of taxes against individual parcels at the date of the surveys.

The situation with respect to delinquency is considerably confused. Basically the amount of tax arrears against any parcel of land depends on the assessed value and mill rate, which together determine the annual tax levy, and the number of years over which taxes have not been paid; but it is also affected by part payment of taxes, by the amount of taxes worked off, for example, by road work, and by the addition of penalties. Further than this under the Tax Consolidation legislation a reduction of up to 25 per cent of tax arrears may be allowed where tax arrears are consolidated and paid in five annual instalments. Normally the owner is given one year to pay arrears. If, at the end of the year, the taxes and penalties are not paid, a caveat is placed on the title; and after a second year, the taxes still remaining unpaid, the land may be put up for sale under tax recovery proceedings. If the land has not been sold within a year the municipality may take title to the land. Under the Tax Recovery legislation arrears may therefore accumulate for three years before the municipality can take title. However, under the difficult circumstances of recent years and with little prospect of disposing of the land, municipalities have been reluctant to take over land. There has always been the possibility that the owner might be able to pay off part, if not all, of the arrears. Consequently many parcels have been delinquent for more than three years; some of them for as many as 10 or more years. Still more recently the Special Areas Board has been using the tax recovery proceedings as a means of acquiring title to land.

TABLE 21.—TAX ARREARS FOR A SAMPLE OF 4,747 PARCELS. SURVEYED AREA. EXCLUDING BOW WEST

Land Class	Tax Arrears per Assessed Acre	Tax Arrears as % Assessed Value
	$	%
I	0.71	14.8
II	0.82	13.2
III	0.71	8.9
IV	0.60	6.6

In all Areas, practically all privately owned parcels were delinquent at the time of the surveys. The level of tax arrears varied appreciably between Areas, even for land in the same land class. Table 21, which is based on the sample of parcels used in the analysis of prices paid for land, indicates that the average tax arrears per assessed acre was highest in Land Class II and lowest in Land Class IV.

The assessed values for parcels in the higher land classes are generally higher than values in the lower land classes. Consequently when tax arrears are expressed as a percentage of assessed value the proportion is highest in Class I and lowest in Class IV. In view of the method of levying taxes (mill rate)

this measure of arrears is more significant than the absolute arrears. The relatively high arrears against Class I and II parcels result from a number of tendencies. First, where individual farmers own parcels of different productivity, they are likely to allow the tax arrears to accumulate against the poorer parcels, while, as far as possible, keeping up payments on better parcels. Second, farmers owning parcels of low productivity are unlikely to make as great an effort to prevent loss of their land through tax recovery proceedings, as are the owners of relatively productive parcels. Finally, farmers on more productive land have probably been in a better position to meet their tax payments.

Mortgage Indebtedness.—Information on land debts was secured from the farmers visited, the amount of debt against particular parcels being recorded. For analysis the debt information used was that for parcels for which purchase prices were obtainable (table 22).

The amount of the present debt is influenced by the terms of the original contract, the payments on principal which have been made, arrears of interest, and adjustment of mortgages. In many cases the actual condition of the mortgage is in doubt. The available evidence shows that, in general, existing land debts on purchased parcels represents between 35 per cent and 40 per cent of the purchase price. The proportion is relatively high in Neutral Hills, Sounding Creek, and Acadia Valley, and low in Berry Creek and Tilley East. On the average the amount of debt per acre is lowest in Land Class I, increasing in the higher land classes; but the proportion of debt to purchase price is substantially the same for all land classes.

TABLE 22.—LAND DEBT PER ACRE AND AS PER CENT OF PURCHASE PRICE, FOR A SAMPLE OF 4,747 PARCELS, BY LAND CLASSES. SURVEYED AREA, EXCLUDING BOW WEST

Land Class	Debt per Acre	Debt as Per Cent Purchase Price
	$	%
I	3.18	38.7
II	4.48	38.2
III	5.36	34.8
IV	5.55	37.2

The amount of debt per acre or per parcel is normally greater for more productive than for less productive land. Provided the resources of the purchasers of different classes of land were similar, the payment of higher prices for more productive land would result in a higher level of indebtedness; but more productive land can support larger annual payments of interest. Even in the area surveyed, where the productivity of land has frequently been inaccurately estimated, generally higher prices have been paid for the more productive parcels. The larger indebtedness per acre in the higher land classes would therefore be expected.

If lands are bought at the 'right' prices i.e. prices related to the net productivity, and the cash resources of the purchasers are in proportion to the prices paid, debts can be serviced with equal ease on lands of different productivity. In the area surveyed, especially in the earlier years, prices paid for Class I parcels were relatively high, making the payment of debts on these parcels particularly difficult. Further, the classification implies that, in the long-run, even if payment of interest on moderate indebtedness on Class I lands would not be impossible, such payment would involve considerable strain. This would be true only to a lesser extent in the case of Class II parcels. In the higher land classes, where parcels were purchased in periods of high prices, existing indebtedness appears out of line with the long-run capacity of the land to pay.

These comments deal with the debt situation at the time of the surveys. It has been pointed out earlier in this report that the validity of the land classification is in no way affected by its implications regarding existing contracts. It may, however, be expected that the use of the land classification in connection with future transactions or modifications of existing contracts, would result in agreements more satisfactory to all concerned, and in more stable use of land.

PART V

SUMMARY

Land Classification in Relation to the Problems of the Dry Areas.—In the dry areas of Western Canada agricultural settlement and production have been peculiarly unstable. Owing to marked fluctuations in weather and prices there has been much uncertainty regarding the long-run physical productivity of land; and regarding prices. Since settlement began much has been learned, through investigation and experience, of the physical bases of production in the dry areas. Although important gaps in attainable knowledge remain, and the future is still uncertain, there is reason to believe that the application of all available knowledge would lead to greater stability of land use. This is the object of classification of land for use, which involves, first, the accumulation of all available information, and second, the application of this information to determine the long-run use-capabilities of particular parcels of land.

The General Approach to Land Classification.—The use of land depends upon the decisions of individual farmers; and, the decisions of farmers depend on their expectations of the returns they can secure from land. Stable land use requires that, over a period of years, farmers can expect to meet their expenses, and secure for themselves returns sufficient to induce them to continue production without expansion or contraction. Under given prices, and with prevailing methods of production, some land may be incapable of providing for these necessary costs (submarginal land); other land will be just sufficiently fertile to cover costs (marginal land); more fertile land will yield a net revenue over the essential costs. Land may therefore be classified on the basis of its estimated capacity to yield net revenue. The approach to the problem of estimating net revenue is outlined in Part II.

Land Classification in the Special Areas (and Rosenheim and Acadia Valley).—The territory with which this report deals includes the Special Municipal Areas of Neutral Hills, Sullivan Lake, Sounding Creek, Berry Creek, Tilley East and Bow West; the municipality of Acadia Valley, and six townships in the municipality of Rosenheim. The total land area involved is 8,103,577 acres.

The field surveys and analysis on which the classification is based extended over the period 1935 to 1940.

The actual procedure of classification is described in detail in Part III. This procedure involved the following steps.

(1) *Preliminary Classification*

(a) Determination of a physical productivity rating for each parcel, based on (i) the average long-run yield of wheat for the soil type of the parcel, (ii) the acreage of tillable land, and (iii) the typical proportion of tillable land in wheat.

(b) Conversion of this measure of gross physical productivity into terms of estimated net revenue using (1) long-term average prices for wheat and other farm products, and (2) a budget of costs derived from farm management survey data.

(c) Preliminary classification on the basis of certain ranges of estimated net revenue. Four classes were distinguished:

Class I —estimated annual production of marketable wheat per quarter available for sale less than 375 bushels, and estimated revenue less than costs (submarginal);

Class II —estimated annual production marketable wheat per quarter available for sale 375-517 bushels, and estimated revenue equal to a range of costs (marginal);

Class III—estimated annual production of marketable wheat per quarter available for sale 518-795 bushels, and estimated net revenue up to $237 per parcel; and,

Class IV—estimated annual production of marketable wheat per quarter available for sale 796-999 bushels, and estimated net revenue of more than $237 and less than $411 per parcel. This classification provided a uniform basis on which to compare parcels in widely scattered areas with significantly different general features.

(2) *Adjustment of Preliminary Classification*

Modification of the preliminary classification of parcels was necessary to allow for the particular features of individual parcels, for example, topography, stoniness, erosion, climate and other physical characteristics, where these features were not adequately provided for in the preliminary classification. Adjustments, where made, were based on (i) descriptive notes made in the field, (ii) aerial photographs, and (iii) re-examination in the field.

(3) *Checking the Classification*

The classification reached through the above steps was subjected to careful checking by the following means: (i) consideration was given to the judgment of local assessors as evidenced by the assessed values of contiguous parcels; (ii) preliminary classification maps were distributed among field men, municipal officers, and others familiar with the territory, and comments and recommendations were sought and received; (iii) during the summer of 1939 the entire area was re-examined, particular attention being given to localities and parcels where the earlier classification was in doubt.

Of the 51,093 parcels in the surveyed area, 79.63 per cent were classified as Class I, 14.15 per cent as Class II, 4.92 per cent as Class III, and 1.30 per cent as Class IV.

Subject to the qualifications noted in the text of the report, Class I parcels are defined as submarginal for wheat production, and suitable for grazing; Class II parcels as marginal for wheat production, and suitable for cultivation in a mixed wheat-growing and grazing unit; Class III parcels as fair wheat land, and suitable for use in a specialized wheat-producing unit; Class IV parcels are defined as good wheat land.

General Characteristics of the Area—

(1) *General Description of the Area*

Topography is not, generally, a serious factor limiting cultivation. Over 80 per cent of the land is level or rolling. Areas of land too hilly to farm occur, and in the level sections of the territory creeks and coulees reduce the tillable acreage in particular parcels.

Most of the surveyed area is in the brown soil zone. Exclusive of waste parcels, 88 per cent of the parcels are in this zone. Dark brown soil occurs in the northern and western fringes. Approximately two thirds of the parcels consist entirely or predominantly of medium textured soils; 18 per cent are classified as consisting of sands; and 12 per cent as including heavy loams or clays. 'Blow-out' conditions (solonized soils) occur extensively.

Climatic conditions are characterized by extremes of temperature, and a low level of precipitation with marked annual variations in rainfall. These conditions result in low long-run wheat yields and pronounced year-to-year fluctuations. The average long-run wheat yield (1921-36) for farms distributed over the entire area was 10.4 bushels; standard deviation, 7.6 bushels; and

coefficient of variability, 73 per cent. Long-run yields differ significantly between soil zones and soil types. The average yield (1921-36) for light soils in the brown belt was 8.3 bushels; for medium to heavy soils in the dark brown belt, 15.4 bushels. The variations in yield (relative to the long-run average) appear to be smaller on the heavier soils.

Density of settlement varies appreciably throughout the area. Records taken between 1937 and 1940 showed 4,421 occupied farmsteads, or one family to every 12 parcels (approximately 3 square miles). Some townships (6 miles square) contained no occupied farmsteads. In a few townships the number of families equalled or exceeded one family per square mile.

Unoccupied buildings provided evidence of extensive abandonment of farms. Forty-two per cent of all buildings found in the surveyed area were vacant; and of these abandoned buildings less than 30 per cent were rated as usable.

A substantial proportion of the area consists of unbroken prairie. Of the land area exclusive of waste (7,895,553 acres) slightly less than two-thirds has never been ploughed; the remainder has been broken at some time. Over 1,733,000 acres, or roughly 60 per cent of the broken land was recorded as recently cultivated.

The records for the surveyed area, excluding Bow West, showed a high proportion of unoccupied parcels (37%); but the proportions of broken and recently cultivated land in unoccupied parcels were relatively low.

The surveyed area contains a relatively high proportion of publicly owned land (55.4% at March, 1940), the proportion having increased appreciably in recent years. Most of the land in public parcels is unbroken, and the large part of the broken land has been idle for some time.

The proportion of privately owned and operated land is relatively low, 24 per cent at the time of the surveys. Most of this land is broken, and the large part of the broken land has been recently cultivated.

Assessed values, at the time of the surveys, were relatively low, and have recently been generally reduced. The average assessed value, for the equalization period 1935-37, was $5.58 per acre. There were few parcels valued at more than $2,000.

The average price, over the period of settlement, paid for 4,747 parcels exclusive of homesteads, pre-emptions, and parcels bought under tax recovery proceedings was $10.78 per acre. Prices for land varied appreciably at different periods. Highest prices were paid between 1915 and 1919.

The situation with respect to tax delinquency was confused. Many parcels were found to have been delinquent for 10 or more years. Practically all privately owned parcels were delinquent at the time of the surveys.

Land debts, for a sample of 4,747 parcels, averaged from $3.18 per acre for Class I parcels to $5.55 per acre for Class IV parcels. The debt per acre represented 35 to 40 per cent of the purchase price.

(2) *Characteristics of the Land Classes*

Class I parcels contain a higher proportion of hilly and eroded land. Ninety-four per cent of the hilly and 98 per cent of the eroded parcels are classified as submarginal. Topography is increasingly favourable in the higher land classes.

Class I parcels consist mainly of sands, solonized loams and loams. Over 87 per cent of the submarginal parcels include these lighter-textured soils. In the higher land classes the soil is generally of heavier texture. Class IV parcels consist largely of heavy loams and clays in the brown zone, and loams and heavy loams in the dark brown zone.

Long-run average wheat yields for Class I parcels ranged from 7.8 bushels in Bow West (1921-36) to 10.7 bushels in Sounding Creek (1922-35). Low yields were associated with high variability. The higher land classes showed higher average yields and lower relative variability. The average yield (1921-36)

for Class IV parcels ranged from 14.4 bushels in Neutral Hills to 15.3 bushels in Bow West.

The density of settlement on Class I parcels was low, and slightly less than one-half of the occupied buildings were located on Class I parcels (79.63% of all parcels). Land in the higher classes was more closely settled.

Class I parcels contain a relatively high proportion of unbroken prairie. Over 70 per cent of Land Class I has never been broken. The proportion of unbroken land in the higher land classes decreases to less than 8 per cent in Class IV parcels.

A relatively high proportion of the broken land in Class I parcels was recorded as idle (63%). In the higher land classes more of the broken land was under cultivation. In Class IV parcels 99 per cent of the broken land was recorded as recently cultivated.

The proportion of unoccupied parcels was relatively high in Land Class I, (43%) decreasing to 5 per cent of Class IV parcels.

The proportion of publicly owned land was relatively high in Land Class I, namely, 66 per cent at March, 1940. The proportion decreased to less than 3 per cent in Land Class IV.

There was relatively little privately owned and operated land in Land Class I (16%). The proportion increased to 74 per cent in Land Class IV.

The average assessed value of Class I parcels was relatively low ($4.76 per acre). Averaged assessed values increased in the higher land classes to $9.81 per acre for Class IV parcels.

The average price paid for Class I parcels, excluding homesteads, pre-emptions, and parcels purchased under tax recovery proceedings, was $8.20 per acre. On the average higher prices had been paid for land in the higher land classes. The average price for Class IV parcels was $14.94 per acre.

Class I parcels showed high tax arrears in relation to assessed value. Tax arrears were 14.8 per cent of assessed value for Class I parcels. The proportion decreased in the higher land classes to 6.6 per cent for Class IV parcels.

Land debt per acre was relatively low for Land Class I but represented about the same proportion of purchase price as in the higher land classes, that is, between 35 and 40 per cent.

These general relations between land class and various features suggest a significant measure of discrimination between lands of different productivity, at the time of settlement and also in later adjustments. However substantial problems remain.

Applications of the Classification.—The classification discloses where problems of adjustment exist; along with the detailed information provided, it may be expected to contribute to their orderly solution.

More specifically the classification may be applied to the following problems:

(1) Movement of settlers from submarginal lands, and the redistribution of population within the area.

(2) Adjustment of land use by defining areas suitable for grazing, and indicating locations in which restoration of grass cover is necessary.

(3) Equalization of assessments.

(4) Adjustment of land contracts to conform to the capacity of the land to pay.

(5) Direction of future land use. Changing conditions of costs and prices would involve modification of any use classification; and it is to be expected that the present classification will require modification in the future. However, the classification will stand as a record of informed judgment regarding the relative productivity of lands within the area surveyed; and, even under more favourable conditions it may serve to check the tendency to the over-optimism and over-expansion which in earlier periods have sown the seeds of later distress and retreat.

APPENDIX A

ALBERTA SPECIAL MUNICIPAL AREAS

The Alberta Special Municipal Areas are constituted and administered under *The Special Areas Act, 1938*(1).

The Act is designed to apply to areas of the province which "include a considerable amount of land which by reason of insufficient rainfall, inferior quality of soil and other causes, cannot by the use of ordinary methods of agriculture be made to yield over a period of years produce in sufficient amount to provide the persons farming such land with the means of livelihood",(2) and in which "a large proportion of such lands has been abandoned by settlers and investors due to their inability to secure an adequate livelihood or compensation therefrom".

Under the Act the Lieutenant Governor in Council is given power "to constitute a Special Area or Special Areas in that part of the province lying west of the easterly boundary of the province and south and east of lines running west between townships 38 and 39 to range 21, then south on range line between ranges 20 and 21 to township 22 and then west along township line between townships 22 and 23, and the lands so included in any Special Area shall be considered as unsuitable for agricultural settlement".

The Areas are administered by the Special Areas Board under the Minister of Lands and Mines. The Board consists of three members and is at present located in Hanna. The Act also provides for the appointment by the Minister, of elected committees to advise in matters affecting the Areas for which they are constituted.

The officers under the Board include fieldmen, of whom there are now four, whose duties have to do mainly with the transfer of land, and the operation of leases; and agricultural fieldmen who are concerned mainly with the agricultural problems of the Areas. There are at present two agricultural fieldmen.

The Board is vested with wide powers, under the Minister, with regard to the acquisition and administration of lands, the control of land use, and the general administration of the Areas.

When an Area is constituted all land registered in the name of incorporated municipalities is transferred to the Crown. Transfers of privately-owned lands to the Crown may be accepted; land may be acquired by purchase; or public lands may be exchanged for any other land within any Area. Proceedings under the provisions of the Tax Recovery Act may be continued. Land required for rehabilitation projects, such as dams, ditches, or roads, may be entered and retained as the property of the Crown as long as required for any of these purposes. No public land may be disposed of without the consent of the Minister, but the Board is empowered to lease public lands at "such rentals, including taxes, as may seem fair and equitable".

Lease agreements are of two kinds, namely, grazing leases and cultivation leases. The rates for these vary in different parts of the Areas. Generally

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(1) For discussion of the original Act of 1927 and the proposals of the Commission which led to the passing of the Act see O. S. Longman 'Land Utilization in Alberta' Prairie Farm Rehabilitation. C.S.T.A. Review No. 23, December 1939.

(2) Statutes of Alberta, 1938. Chapter 92. See also Chapter 34, 1939 and Chapter 28, 1940.

higher rates are charged for land in those areas, to the north and west, falling within the dark brown soil zone. In these areas the grazing rate, including taxes, is 3 cents per acre. In the remainder of the Bow West, Sullivan Lake and Sounding Creek Areas, and in the Tilley East Area, north of township 18 and the Saskatchewan River, the rate is 2½ cents per acre. All other grazing leases, that is in the Berry Creek and Tilley East Areas are at the rate of 2 cents per acre. In 1939 the rental, including taxes, for cultivation leases was one-fifth of the crop, except in the portions of the Berry Creek and Tilley East Areas referred to above, that is, where the grazing rate is 2 cents. In these areas the cultivation rate was one-sixth of the crop.

With respect to the control of land use the Minister is empowered (a) "to direct that any of the public lands or interest therein within a Special Area shall be dealt with in such manner as may seem to him to be for the benefit of the residents of the Special Area, or to prohibit the dealing therein in any manner which seems to him to be detrimental to such residents"; (b) "to set aside lands for community purposes, such as grazing reserves, hay reserves, water reserves and irrigation, and to make such provisions for the administration thereof as may be deemed advisable"; (c) "to order and require any owner or occupant of lands to adopt such methods of farming or grazing, or farming and grazing as may be deemed necessary to prevent soil drifting or over-grazing, or any hazard which may dissipate or nullify any assistance rendered to residents within the Special Area"; (d) "to promote approved farm cultural practices and efficient range management, also such community effort and enterprise as may contribute to greater economic security of residents of the Special Area"; and, for the purpose of controlling community grazing areas to make provision for the administration of these and to prescribe the manner of their use.

All revenue derived from public lands, in respect of any lease or any interest in public lands, is deposited in the "Provincial Treasurer Special Area Trust Account". The revenue so obtained, or any part of it, may be used for (a) "the construction and maintenance of roads, schools and hospitals"; (b) "any social services;" (c) "the costs of administration"; (d) "the development of any natural resources"; (e) "the carrying out of improvements within any Special Area"; and, (f) "the rehabilitation of settlers within any Special Area".

The Special Areas, as outlined in this report, were constituted in the following order and at the times indicated. The portion of the Tilley East Area west of the South Saskatchewan River was formed into a Special Area in 1927, although reorganization activities were unimportant until 1929. The eastern portion was added to the Area in 1936. The Berry Creek Area was formed in 1932. In 1935, the Neutral Hills, Sullivan Lake, and Sounding Creek Areas were added; and the Bow West Area was formed in 1937.

The boundaries of the Areas have recently been redefined, and there are now only four administration units. This has been effected by joining the Sullivan Lake and Berry Creek Areas, and also the Neutral Hills and Sounding Creek Areas.

The six townships in Rosenheim Municipal District, referred to in the report, are now (1940) incorporated into the Neutral Hills-Sounding Creek Area. Acadia Valley Municipal District was at one time included in the Sounding Creek Area, but the municipality continued to function, and since 1939 Acadia Valley has been outside the Special Areas.

The area now contained within the boundaries of the Special Areas, including the six townships in Rosenheim, amounts to 7,838,826 acres. This acreage is inclusive of waste lands as defined in this report, but is exclusive of the acreage contained within the statutory north-south and east-west road-allowances.

APPENDIX B.

STATISTICAL BASES OF CLASSIFICATION

The following budgetary data, based on survey material, were used in determining the margin of wheat production, and the preliminary classification based on estimated net revenue.

LIVE STOCK

	Number
Horses	10
Cows	4
Other Cattle	4
Sows	1
Other Hogs	6
Poultry	73

LAND USE

	Acres	*Yield*
Wheat	173	1,372 bu.
Oats	48	697 bu.
Rye or Barley	6	114 bu.
Fallow	146	—
Pasture and Hay	107	10 ton
Total	480	—

FARM RECEIPTS

Wheat Sales	$1,262
Live Stock Sales	112
Produce Sales	75
Total	1,449

DEPRECIATION

Equipment	$ 60
Buildings	75
Total	$135

FARM EXPENSES

Paid Labour and Board	$ 58
Taxes	126
Threshing and Board	199
Binder Twine	46
Equipment Repairs	41
Building Repairs	15
Feed Grinding	12
Other	68
Total	$565

LOWER LIMIT OF MARGIN

Revenue:		Costs:	
Live Stock and Produce	$ 187	Operator's Earnings	$ 585
Threshing (labour)	63	Depreciation	135
1,125 bu. Wheat at 92c	1,035	Other Expenses	565
Total	$1,285	Total	$1,285

UPPER LIMIT OF MARGIN

Revenue:		Costs:	
Live Stock and Produce	$ 187	Operator's Earnings	$ 891
Threshing (labour)	77	Depreciation	135
1,552 bu. Wheat at 92c	1,427	Other Expenses	665
Total	$1,691	Total	$1,691

The differences between the budget for the upper limit of the margin, and that for the lower limit may be explained as follows:

(1) Threshing Labour. In determining the budget it was assumed that one-third of the cost of threshing would be met by exchange labour. As the full threshing cost is included in 'other expenses', the value of exchange labour is shown on the revenue side. The cost of threshing on land at the upper limit of the margin was estimated to be $42 more than the cost of threshing the smaller production at the lower limit. The item of 'Threshing labour' is therefore $14 more than in the budget for the lower limit of the margin.

(2) Operator's Earnings. The figure of $891 represents average living costs, including half the expenses of running a car; these living costs being determined from farm studies. The smaller figure of $585, included in the budget for the lower limit, represents the long-run average annual wages of hired farm workers.

(3) Other Expenses. The figure of $665 represents the expenses shown in the budget for the lower limit ($565) plus additional threshing cost of $42, and one-half the cost of running a car, that is, $58.

The bases for classification in terms of estimated net income per quarter-section, and estimated annual production of marketable wheat available for sale per quarter-section, are summarized in the following table.

STATISTICAL BASES FOR LAND CLASSES

Land Class	Estimated Net Revenue per Quarter-Section	Bushels of Wheat Available for Sale per Quarter-Section	Suitable for
	$	Bu.	
Class I —Non-arable	(negative)	0–374	Grazing
Class II —Marginal	0	375–517	Grazing & Wheat
Class III—Fair Wheat Land	1–237	518–795	Wheat
Class IV—Good Wheat Land	238–410	796–999	Wheat

APPENDIX C.

TABLE 1.—ANNUAL PRECIPITATION AT MEDICINE HAT. 1921-36(1)

Year	Rainfall in Inches	Per Cent of Average 1921-36
1936	9.63	75.8
1935	12.50	98.4
1934	13.05	102.8
1933	15.10	118.9
1932	16.81	132.4
1931	9.96	78.4
1930	13.23	104.2
1929	8.17	64.3
1928	7.64	60.2
1927	25.28	199.1
1926	10.88	85.7
1925	14.36	113.1
1924	9.86	77.6
1923	13.64	107.4
1922	11.34	89.3
1921	11.74	92.4
Average 1921-36	12.7	100.0

(1) From Monthly Record of Meteorological Observations. Meteorological Service of Canada. Medicine Hat lies on the southern boundary of the Tilley East Area. Accurate records, extending over a long period of years, are available for this station.

TABLE 2.—ANNUAL AVERAGE WHEAT YIELDS BY LAND CLASSES(1). SURVEYED AREA

Year	Land Class							
	I		II		III		IV	
	No. of Records	Average Yield	No. of Records	Average Yield	No. of Records	Average Yield	No. of Records	Average Yield
1936	721	1.4	625	2.1	389	2.4	56	3.4
1935	845	4.8	737	5.5	391	6.8	58	8.9
1934	748	2.6	672	3.6	335	5.1	55	7.0
1933	696	2.8	607	3.9	294	6.3	51	7.9
1932	725	11.3	623	13.4	317	15.7	58	21.7
1931	641	3.9	554	5.8	272	9.5	50	11.8
1930	635	7.5	548	9.7	270	14.1	49	12.9
1929	618	4.9	543	6.1	269	7.6	50	8.6
1928	614	19.6	557	22.4	276	22.5	50	25.6
1927	562	23.0	512	26.1	255	28.1	48	30.5
1926	478	9.6	412	11.4	202	13.4	41	14.4
1925	463	12.6	388	14.2	194	17.3	35	19.5
1924	440	4.2	368	5.1	199	5.5	34	7.2
1923	454	21.5	390	23.0	200	25.8	38	30.6
1922	382	6.9	317	8.2	156	10.6	25	11.8
1921	338	7.6	303	8.1	141	12.1	23	10.7
1920	351	13.6	311	14.6	142	16.1	22	19.9
1919	242	4.3	216	5.1	71	7.5	16	9.5
1918	232	4.8	200	6.3	67	5.1	16	6.4
1917	219	9.5	203	12.2	65	12.6	15	15.9
1916	217	27.4	205	30.0	63	26.3	15	29.9
1915	209	36.3	205	38.3	61	35.5	13	37.9

(1) These yields are shown graphically in Chart 3, p. 43.

TABLE 3.—AVERAGE PRICE OF WHEAT, BY CROP YEARS. No. 2 NORTHERN. NET PRICE. HANNA(1

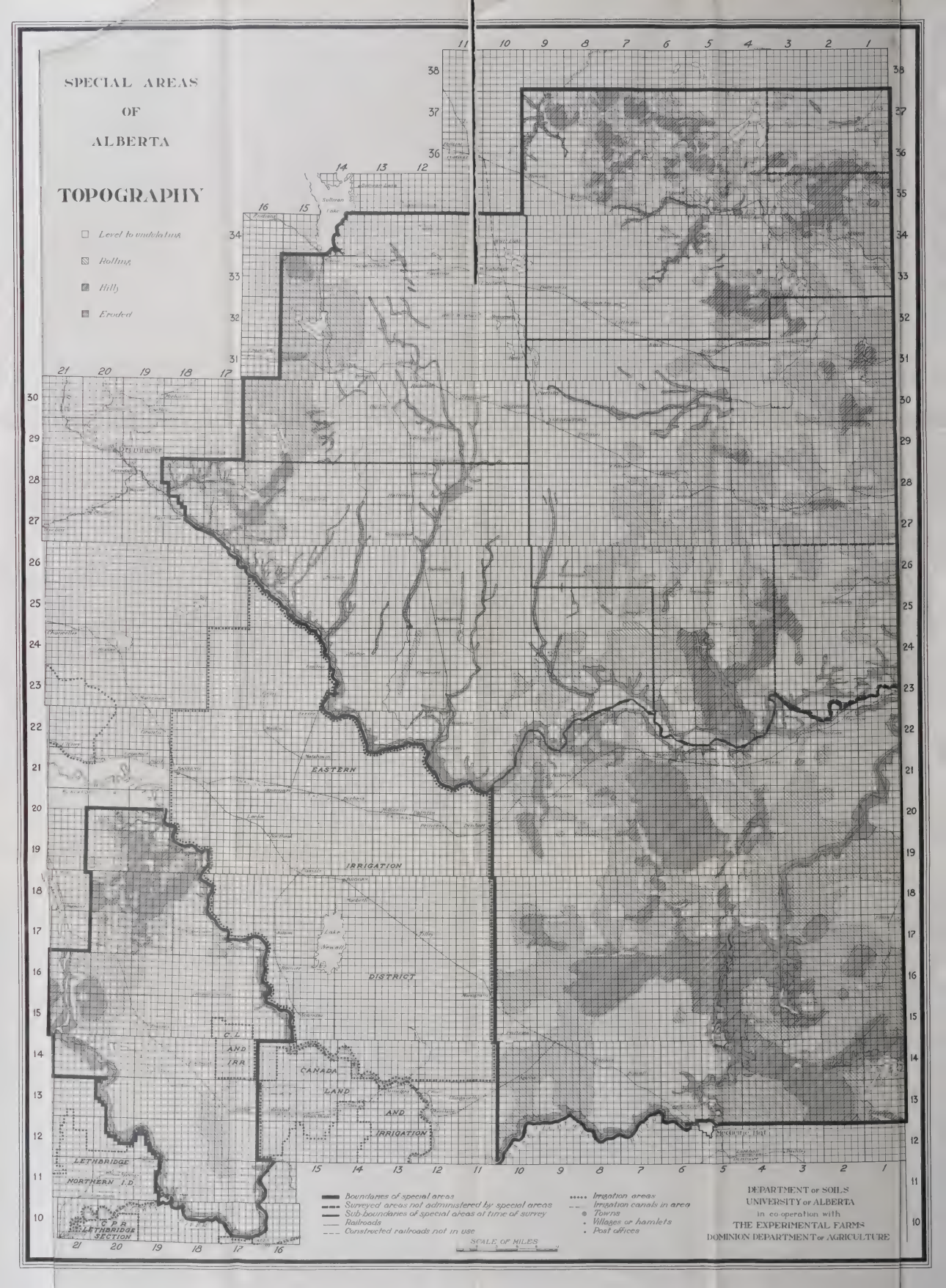
Crop Year	Price Per Bushel	Per Cent of Average 1921-36
	$	
1935–36	0.64	69.6
1934–35	0.60	65.2
1933–34	0.44	47.8
1932–33	0.34	37.0
1931–32	0.37	40.2
1930–31	0.43	46.7
1929–30	1.03	112.0
1928–29	1.02	110.9
1927–28	1.22	132.6
1926–27	1.23	133.7
1925–26	1.28	139.1
1924–25	1.45	157.6
1923–24	0.88	95.7
1922–23	0.89	96.7
1921–22	1.06	115.2
1920–21	1.78	193.5
Average 1921–36	0.92	100.0

(1) Fort William price less freight rate of 18.6c per bushel.

TABLE 4.—RURAL POPULATION OF SURVEYED AREAS BY CENSUS YEARS

	Neutral(1) Hills	Sullivan Lake	Sounding(2) Creek	Berry Creek	Tilley East	Bow West	Surveyed Areas
1936	5349	3925	5059	1724	4796	3009	23,862
1931	6651	4492	7470	2761	4999	3253	29,626
1926	5991	4027	7168	2900	4293	2834	27,213
1921	6925	4946	9059	5630	7366	4662	38,588
1916	6064	4101	7244	4667	6940	4027	33,043
1911	3027	2698	3137	2875	3675	3650	19,062
1906	80	25	47	115	325	147	739
1901	——	——	20	42	169	10	241

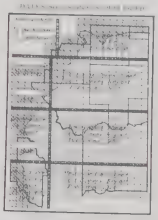
(1) Including six townships in Rosenheim M.D.
(2) Including Acadia Valley M.D.


SPECIAL AREAS
OF
ALBERTA
TOPOGRAPHY
Level to undulating
Rolling
Hilly
Eroded
EASTERN
IRRIGATION
DISTRICT
CANADA
LAND
AND
IRRIGATION
C. L.
AND
IRR.
LETHBRIDGE
NORTHERN I.D.
C.P.R.
LETHBRIDGE
SECTION
Boundaries of special areas
Surveyed areas not administered by special areas
Sub-boundaries of special areas at time of survey
Railroads
Constructed railroads not in use
Irrigation areas
Irrigation canals in area
Towns
Villages or hamlets
Post offices
SCALE OF MILES
DEPARTMENT OF SOILS
UNIVERSITY OF ALBERTA
in co-operation with
THE EXPERIMENTAL FARMS
DOMINION DEPARTMENT OF AGRICULTURE

SPECIAL AREAS OF ALBERTA

SOILS

- Clay
- Heavy loam
- Fine sandy loam
- Alkali
- Mixed
- Loam
- Clay loam
- Light loam
- Sandy loam
- River bottom
- Non permanent lake
- Silt loam
- Very fine sandy loam
- Sand
- Eroded
- Marsh
- Blowout



Drumheller

EASTERN IRRIGATION DISTRICT

CANADA LAND AND IRRIGATION

C.P.R.

LETHBRIDGE NORTHERN I.D.

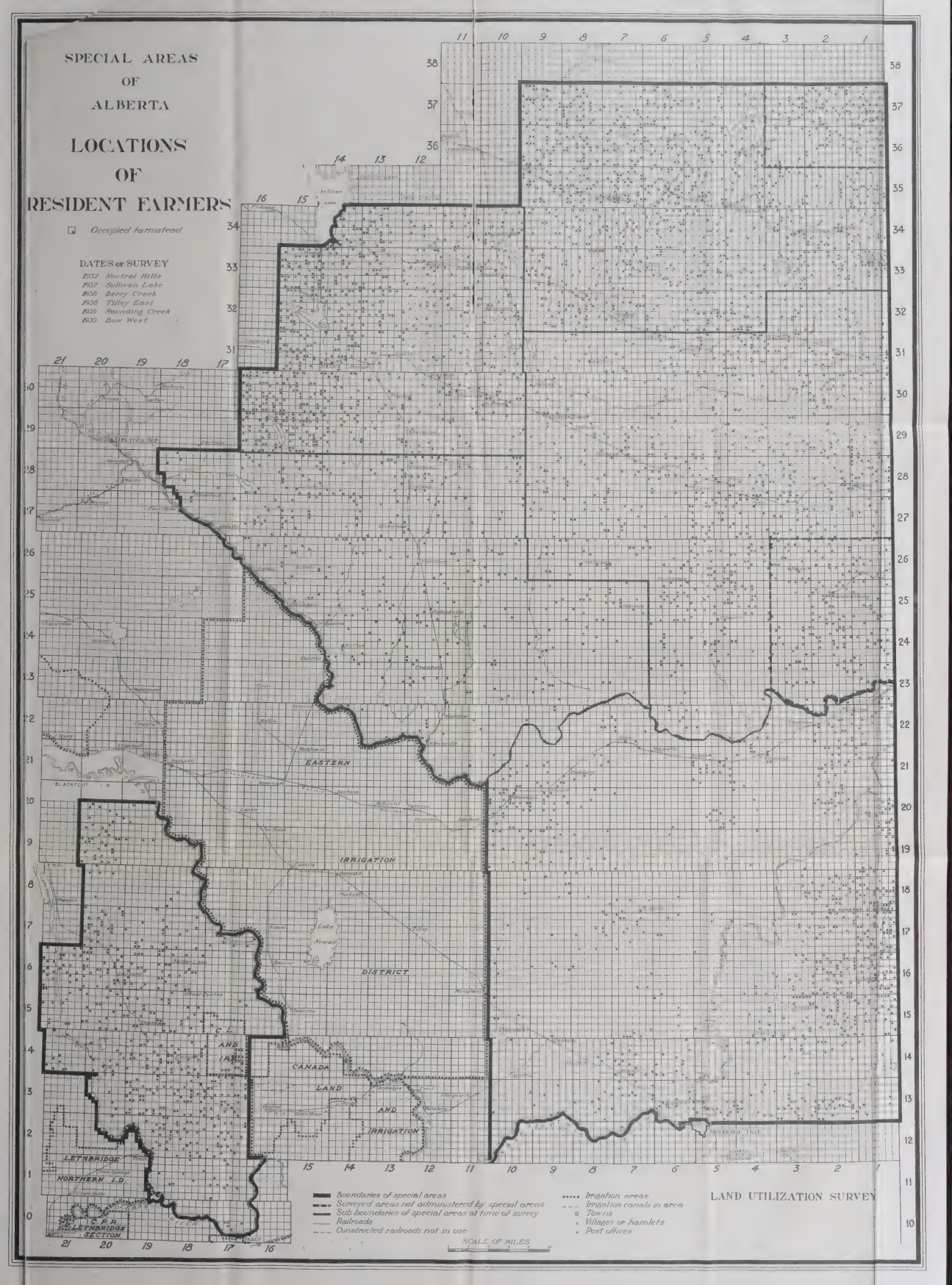
C.P.R. LETHBRIDGE SECTION

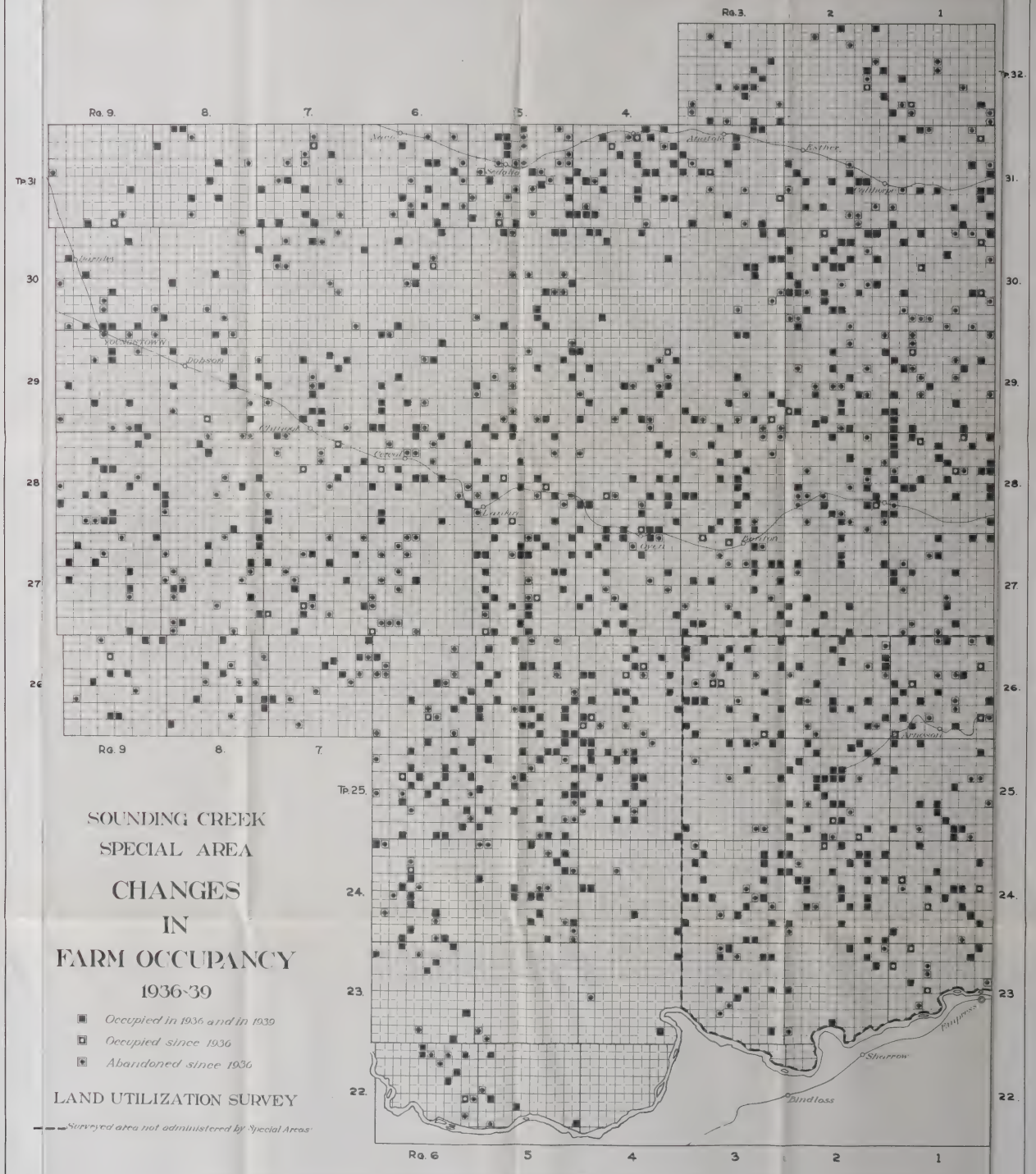
Medicine Hat

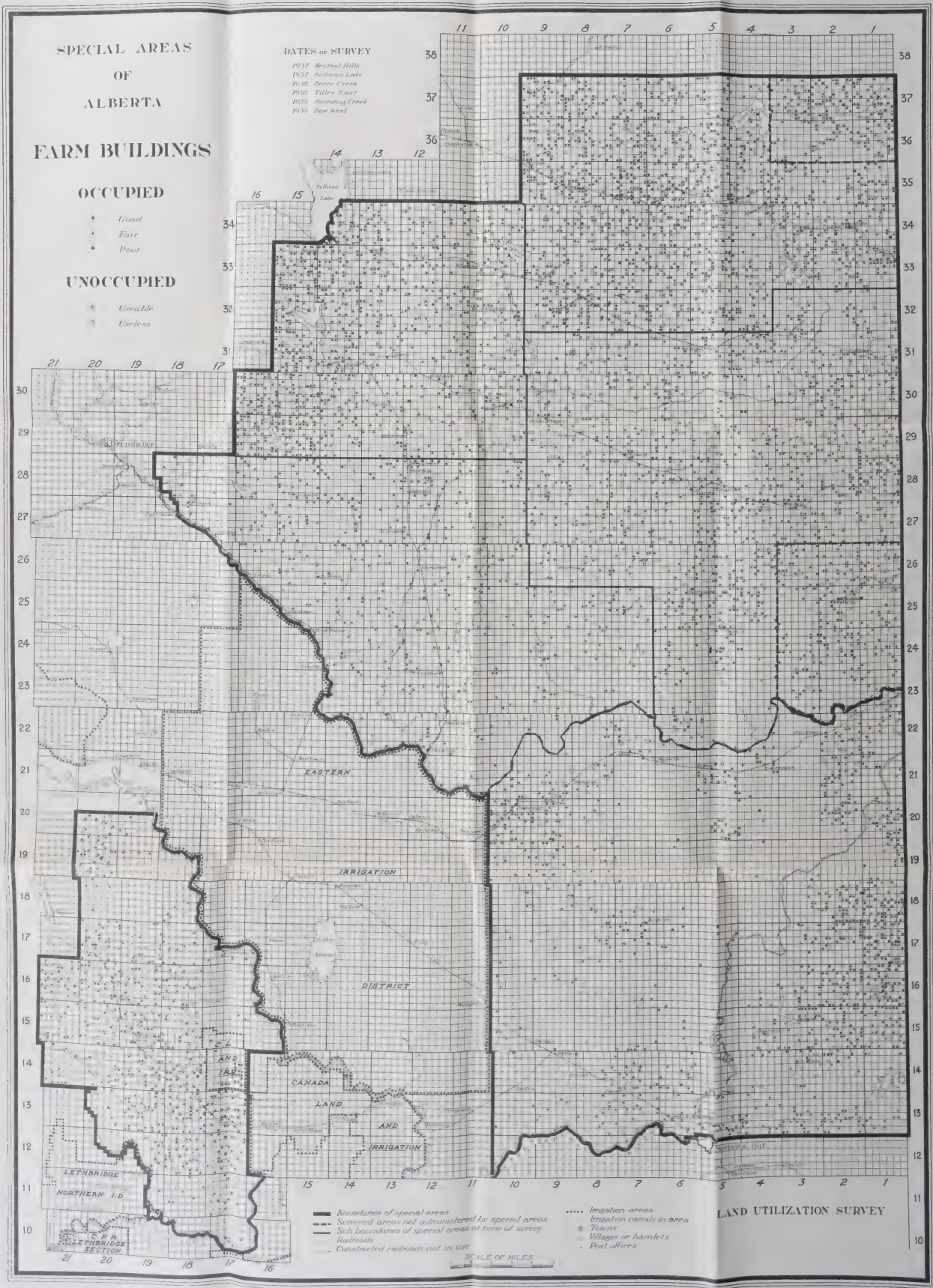
- boundaries of special areas
- Surveyed areas not administered by special areas
- Sub boundaries of special areas at time of survey
- Railroads
- Constructed railroads not in use
- Irrigation areas
- Irrigation canals in area
- Towns
- Villages or hamlets
- Post offices

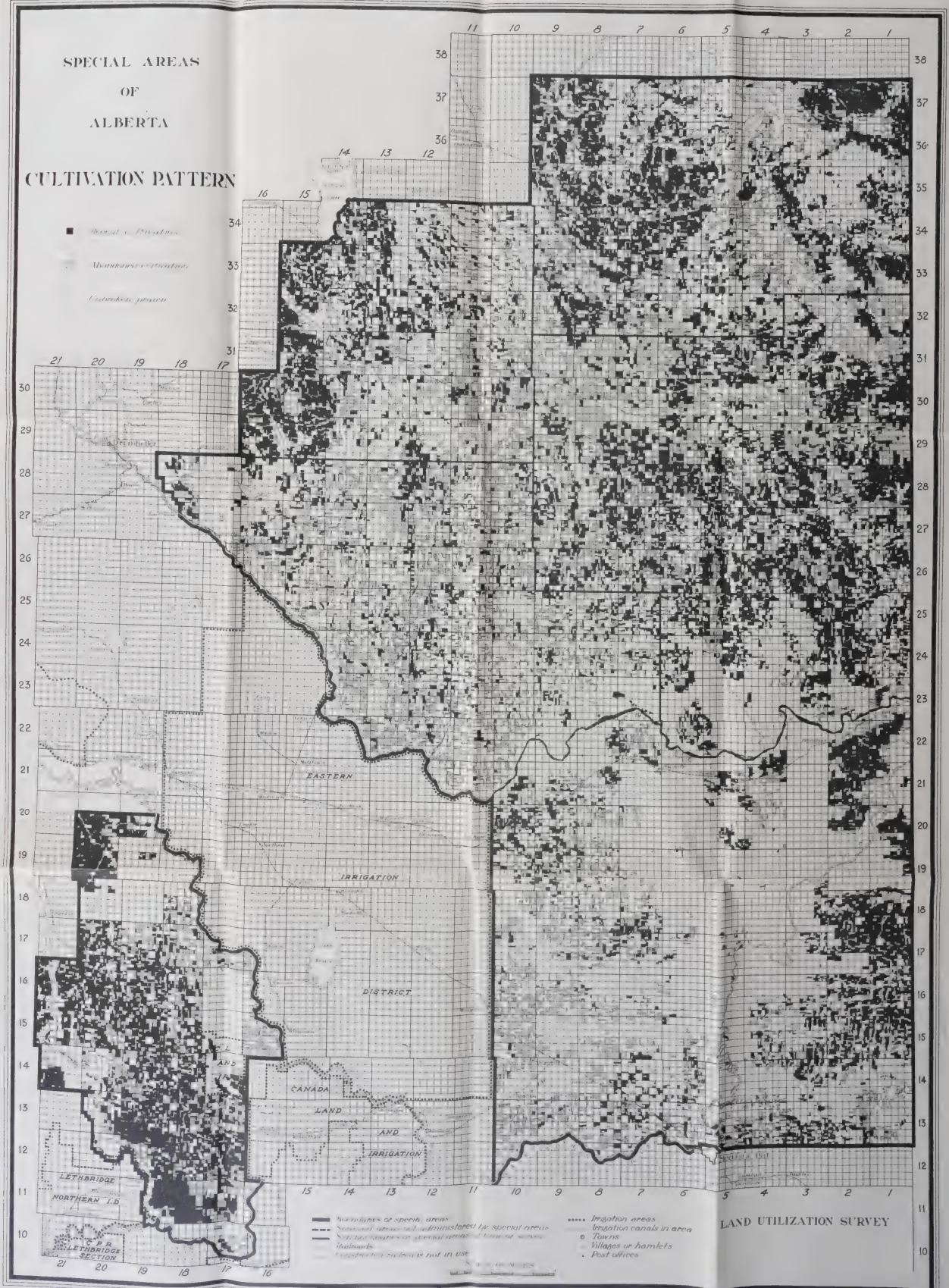
SCALE OF MILES

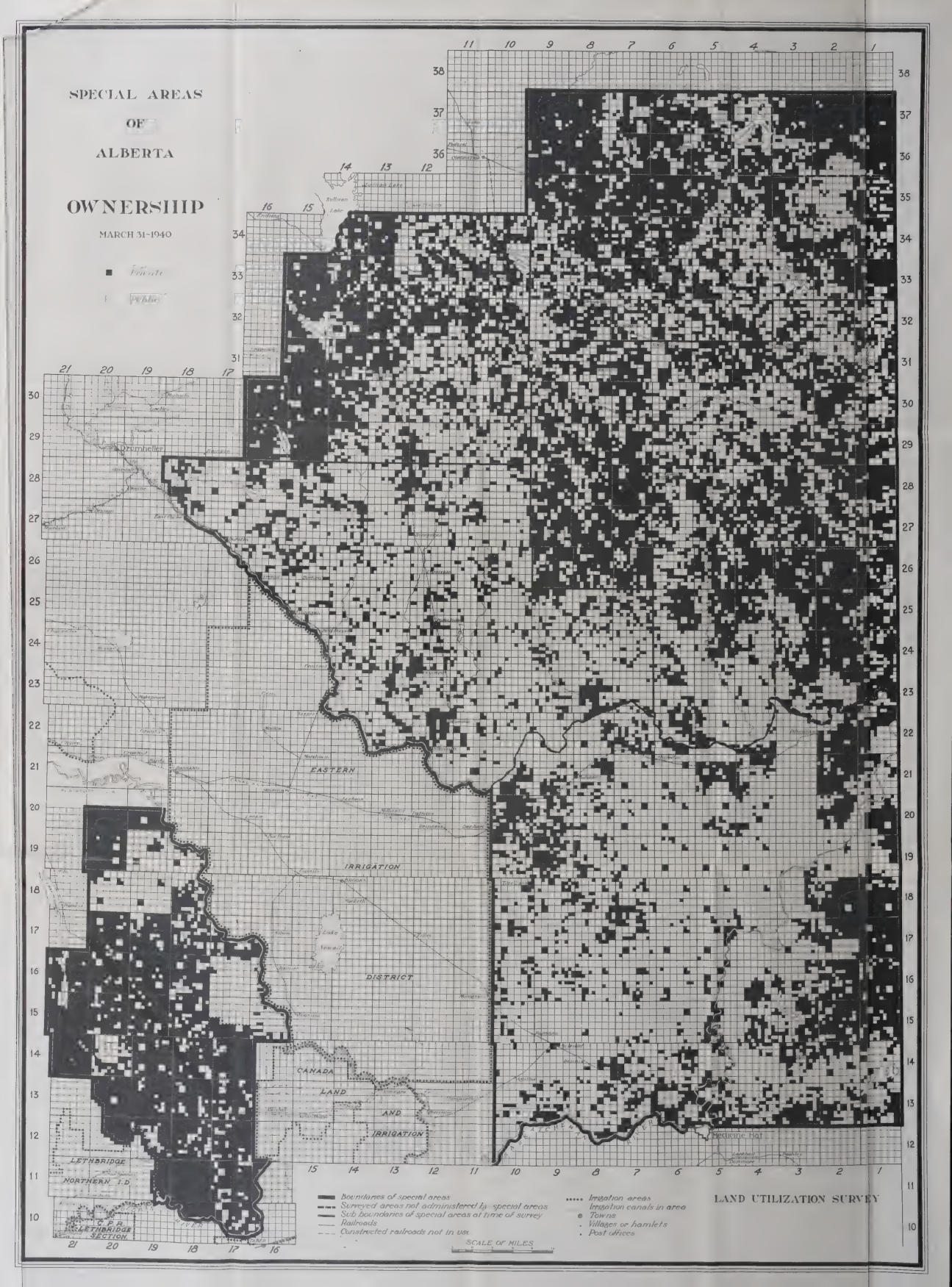
DEPARTMENT OF SOILS
UNIVERSITY OF ALBERTA
in co-operation with
THE EXPERIMENTAL FARMS
DOMINION DEPARTMENT OF AGRICULTURE

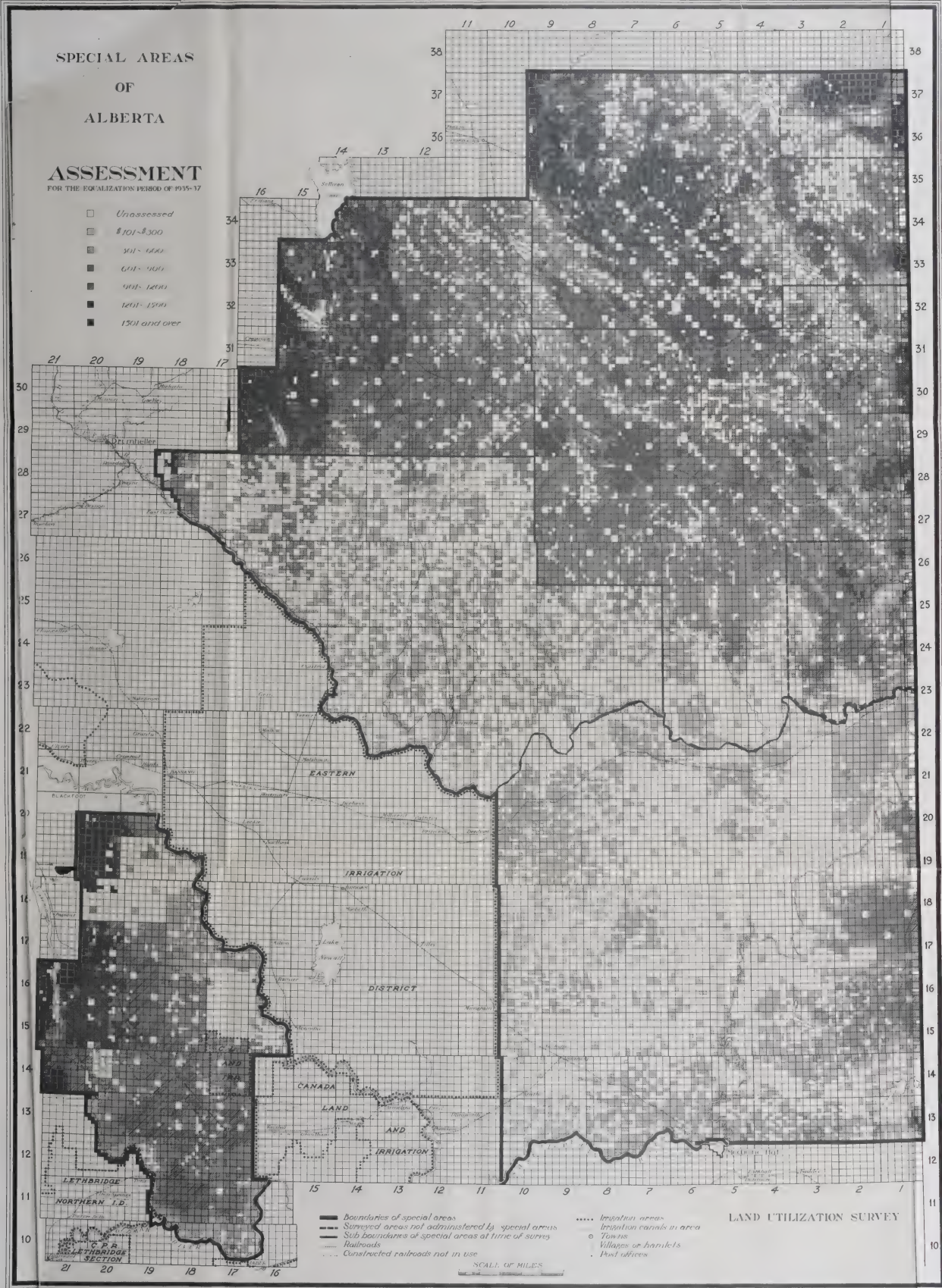

SPECIAL AREAS
OF
ALBERTA
LOCATIONS
OF
RESIDENT FARMERS
Occupied farmstead
DATES OF SURVEY
1937 Neutral Hills
1937 Sullivan Lake
1938 Berry Creek
1938 Tilley East
1939 Sounding Creek
1939 Bow West
EASTERN
IRRIGATION
DISTRICT
CANADA
LAND
AND
IRRIGATION
C.P.R.
AND
I.R.
LETHBRIDGE
NORTHERN I.D.
C.P.R.
LETHBRIDGE
SECTION
BLACKFOOT I.R.
Boundaries of special areas
Surveyed areas not administered by special areas
Sub-boundaries of special areas at time of survey
Railroads
Constructed railroads not in use
Irrigation areas
Irrigation canals in area
Towns
Villages or hamlets
Post offices
SCALE OF MILES
LAND UTILIZATION SURVEY

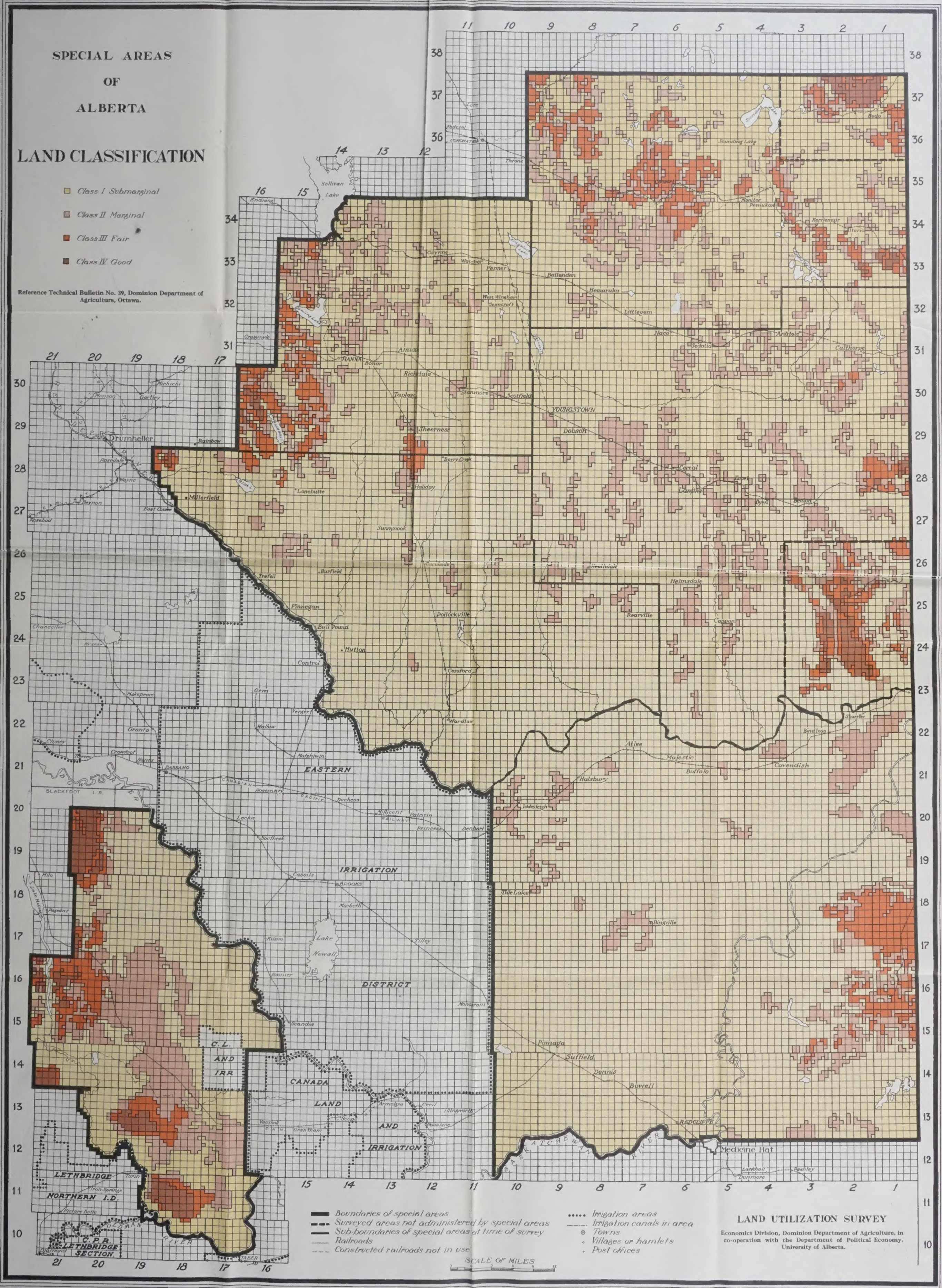

Rg. 9.
8.
7.
6.
5.
4.
3.
2.
1.
Tp. 32.
31.
30.
29.
28.
27.
26.
25.
24.
23.
22.
Tp. 31
Rg. 9
8.
7.
Rg. 6
5
4
3
2
1
Mustus
Esther
Dobson
Sherrow
Lindloss
SOUNDING CREEK
SPECIAL AREA
CHANGES
IN
FARM OCCUPANCY
1936-39
Occupied in 1936 and in 1939
Occupied since 1936
Abandoned since 1936
LAND UTILIZATION SURVEY
Surveyed area not administered by Special Areas


SPECIAL AREAS
OF
ALBERTA
FARM BUILDINGS
OCCUPIED
Good
Fair
Poor
UNOCCUPIED
Useable
Useless
DATES OF SURVEY
1937 Neutral Hills
1937 Sullivan Lake
1936 Berry Creek
1936 Tilley East
1939 Sounding Creek
1939 Bow West
Sullivan Lake
Drumheller
EASTERN
IRRIGATION
DISTRICT
C.P.R. AND C.L. AND I. CO.
CANADA LAND AND IRRIGATION
LETHBRIDGE NORTHERN I.D.
C.P.R. LETHBRIDGE SECTION
Boundaries of special areas
Surveyed areas not administered by special areas
Sub boundaries of special areas at time of survey
Railroads
Constructed railroads not in use
Irrigation areas
Irrigation canals in area
Towns
Villages or hamlets
Post offices
SCALE OF MILES
LAND UTILIZATION SURVEY


SPECIAL AREAS
OF
ALBERTA
CULTIVATION PATTERN
EASTERN
IRRIGATION
DISTRICT
CANADA
LAND
AND
IRRIGATION
LETHBRIDGE
NORTHERN I.D.
C.P.R.
LETHBRIDGE
SECTION
LAND UTILIZATION SURVEY


SPECIAL AREAS
OF
ALBERTA
OWNERSHIP
MARCH 31-1940
Private
Public
Drumheller
EASTERN
IRRIGATION
DISTRICT
CANADA
LAND
AND
IRRIGATION
LETHBRIDGE
NORTHERN I.D.
C.P.R.
LETHBRIDGE
SECTION
Medicine Hat
Boundaries of special areas
Surveyed areas not administered by special areas
Sub. boundaries of special areas at time of survey
Railroads
Constructed railroads not in use
Irrigation areas
Irrigation canals in area
Towns
Villages or hamlets
Post offices
SCALE OF MILES
LAND UTILIZATION SURVEY


SPECIAL AREAS
OF
ALBERTA
ASSESSMENT
FOR THE EQUALIZATION PERIOD OF 1935-37
Unassessed
$101-$300
301- 600
601- 900
901- 1200
1201- 1500
1501 and over
Drumheller
EASTERN
IRRIGATION
DISTRICT
CANADA
LAND
AND
IRRIGATION
LETHBRIDGE
NORTHERN I.D.
C.P.R.
LETHBRIDGE
SECTION
Boundaries of special areas
Surveyed areas not administered by special areas
Sub boundaries of special areas at time of survey
Railroads
Constructed railroads not in use
Irrigation areas
Irrigation canals in area
Towns
Villages or hamlets
Post offices
SCALE OF MILES
LAND UTILIZATION SURVEY


SPECIAL AREAS
OF
ALBERTA
LAND CLASSIFICATION
Class I Submarginal
Class II Marginal
Class III Fair
Class IV Good
Reference Technical Bulletin No. 39, Dominion Department of Agriculture, Ottawa.
Boundaries of special areas
Surveyed areas not administered by special areas
Sub boundaries of special areas at time of survey
Railroads
Constructed railroads not in use
Irrigation areas
Irrigation canals in area
Towns
Villages or hamlets
Post offices
SCALE OF MILES
LAND UTILIZATION SURVEY
Economics Division, Dominion Department of Agriculture, in co-operation with the Department of Political Economy, University of Alberta.
EASTERN
IRRIGATION
DISTRICT
CANADA
LAND
AND
IRRIGATION
C.L.
AND
IRR.
LETHBRIDGE
NORTHERN I.D.
C.P.R.
LETHBRIDGE
SECTION
SASKATCHEWAN RIVER
Drumheller
HANNA
YOUNGSTOWN
BROOKS
Lake Newell
Medicine Hat
REDCLIFFE
Sounding Lake
Sheerness
Cereal
Oyen
Atlee
Empress
Bindloss
Cavendish
Buffalo
Majestic
Halsbury
Bassano
Suffield
Dennis
Bowell
Tide Lake
Bingville
Princess
Patricia
Duchess
Rosemary
Lonebutte
Millerfield
Finnegan
Bull Pound
Hutton
Pollockville
Cessford
Wardlaw
Burfield
Sunnynook
Richdale
Stanmore
Scotfield
Dobson
Youngstown
Helmsdale
Capon
Rearville
Naco
Sedalia
Anatole
Calthorpe
Hemaruka
Ballenden
Littlegem
Veteran
Coronation
Throne
Monitor
Kirriemuir
Esther
Bodo
Metiskow
Chinook
Acadia Valley
Alsask
Gem
Verger
Makepeace
Gleichen
Crowfoot
Hussar
Cluny
Milo
Armada
Vulcan
Lomond
Enchant
Retlaw
Vauxhall
Grantham
Scandia
Rainier
Kitsim
Tilley
Rolling Hills
Iron Springs
Turin
Picture Butte
Taber
Cecil
Bow Island
Lethbridge
Barnwell
Dunmore
Irvine
Walsh
Pashley
Lockhall
Bloomsbury
Rosedale
Wayne
East Coulee
Rosebud
Munson
Morrin
Michichi
Rainbow
Delia
Craigmyle
Endiang
Sullivan Lake
Byemoor
Chancellor
BLACKFOOT I.R.
RED DEER RIVER
OLDMAN RIVER

Figures 2 – 10
in pocket